



November 14, 2017

Ms. Ellen Lyons
Alaska District Regulatory Division
US Army Corps of Engineers
2175 University Avenue, Suite 201E
Fairbanks, AK 99709-4927

RE: Armstrong Energy, LLC Comments
Nanushuk Project Draft Environmental Impact Statement

Dear Ms. Lyons:

Armstrong Energy, LLC (Armstrong) appreciates the opportunity to provide comments on the U.S. Army Corps of Engineers' (USACE) Nanushuk Project Draft Environmental Impact Statement (DEIS).

We commend the USACE on preparing a comprehensive document that complies with the requirements of the National Environmental Policy Act (NEPA) and the Council on Environmental Quality's implementing regulations. As a constructive participant in the NEPA process, Armstrong offers its comments for improvements to help the public better understand the potential environmental effects of the Nanushuk Project (Project) and action alternatives. We also provide clarifications related to the project description. Our recommendations are intended to help ensure that the Final Environmental Impact Statement (FEIS) presents a complete and fair evaluation of the Project.

Armstrong's comments on key or recurring topics within the DEIS are summarized below. An itemized list of specific comments is enclosed.

Project Updates

As documented in Armstrong's July 2017 Department of the Army (DA) Permit Application, we made several project updates in response to stakeholder comments and feedback. These updates do not increase the potential environmental effects presented in the DEIS and, in fact, would result in a smaller overall project footprint. Armstrong proposes to reduce the gravel footprint of the Project by approximately 45 acres from the total reflected in the DEIS by narrowing the gravel access road surface width from 38 feet to 35 feet and modifying both infield and access road side slopes from 3:1 to 2:1. We are aware the USACE was unable to incorporate the July 2017 changes into the DEIS, and request that they be incorporated into the project description and the overall effects analysis associated with the Applicant's Proposed Action (Alternative 2) and the other action alternatives (Alternatives 3 through 5) in the FEIS.

Environmental Consequences Methods

Armstrong appreciates the substantial work done by the USACE to develop and implement a thorough environmental consequences analysis. We have several recommendations with



respect to clearly defining and explaining impact criteria and the anticipated intensity and context of the potential effects of the Project as proposed.

The USACE's use of defined criteria to evaluate potential effects to resources within each section is commendable. We recommend consistently informing the reader of the factors considered in establishing criteria for each resource. For example, 40 tons per year of emissions is used as a differentiating factor between a minor and moderate effect in evaluation of air quality, but the reader is not informed of the reason this value was selected.

Further, the criteria definitions for a given impact category (e.g., magnitude) should not use terms from another impact category (e.g., duration) because criteria should be evaluated independently. The sections where impact categories are comingled should be revised. For example, the magnitude criteria for fish and invertebrates currently incorporate duration (i.e., minor: "effect would cause short-term, or low-level behavioral disturbance...;" moderate: "effect would cause long-term behavioral disturbance...").

Finally, the analysis of effects would benefit from the addition of the term "negligible." This would allow for disclosure of potential effects, while appropriately identifying effects that would be immeasurable or inconsequential. For example, there are effects currently categorized as "minor" that would be more appropriately described as negligible. This is particularly applicable to the hydrology section where minor magnitude effects are defined as changes that are not measurable. We recommend the term negligible be introduced and defined in Section 3.1 and used as appropriate in the discussion of resource effects.

Environmental Consequences Analysis

We commend USACE on the thorough analysis of the potential effects related to the Project presented in Chapter 3 of the DEIS. This detailed review takes a hard look at the direct, indirect, and cumulative impacts of the proposed Project. Nevertheless, we have identified certain recurring issues and we provide the following suggestions to further improve the analysis in the FEIS.

First, we suggest that the FEIS more consistently provide a succinct and meaningful summary of key effect findings for each resource section of Chapter 3 to clearly communicate the overall effect to each resource. Similarly, we recommend that the comparison of alternatives avoid bulleted lists of rankings but rather provide a discussion of the meaningful differences between alternatives and refer to quantitative measures provided in tables as necessary.

Second, within the discussion of effects common to all alternatives, we recommend that the analysis clearly explain the reasoning for the stated effect findings. This information is often available in the preceding paragraphs and/or pages, but it would be helpful to concisely describe how the effects described fall within the defined criteria. We believe that this would also aid in ensuring that the effects described are consistent with the criteria as defined.

Third, many key findings and statements found in the "impact" column of the summary tables rely on "if" statements or a series of events but are presented as if those events would be certain to occur. These should be modified to include all of the variables that would lead to the effect, or the probability should be corrected. This issue is particularly problematic in the discussion of hydrology impacts and the environmental effects related to an oil spill or other accidental release, both of which are discussed in more detail below. We recommend that careful attention be paid to clarifying discussions of probability in the FEIS to avoid overstating



environmental effects where those effects would only occur if one or more unlikely event, such as an oil spill or culvert wash-out, occurred first.

Fourth, while not included in the impact criteria, we ask that each effect finding include a clear statement of the spatial extent over which the effect is expected to occur. This information is important for effectively communicating the context of the impacts described and is not clearly conveyed in all resource sections. We suggest presenting a more finely-detailed analysis of the effects to communicate at what distance from project infrastructure the effects could be anticipated to occur. For example, the discussions of both birds and terrestrial mammals do not inform the reader how far from project infrastructure the effects could extend.

Fifth, the DEIS includes discussion of potential environmental consequences within the context of previous documented instances of effects from past industrial operations on the North Slope. We request that the FEIS focus on effects anticipated from the proposed Project in a way that fully considers project design, mitigation measures, and Best Management Practices (BMPs) in the evaluation of the effects. Where conservative assumptions are used or conservative findings of effects are made, we request that the FEIS readily and clearly acknowledge this conservatism as the basis on which the conclusion was made. Please refer to our comments on wildlife and hydrology in this letter and enclosure for specific examples.

Finally, we recommend reviewing the descriptions of potential effects in the Executive Summary and Chapter 2 (Table 2.4-2) for consistency with each resource section. As currently written, many of the conclusions presented in Tables ES 5-1, ES 6-2, and 2.4-2 summarize the range of effects such that they present a spectrum of potential effects (“minor to major,” “unlikely to probable,” and/or “short term to long term”), but do not communicate the anticipated extent or significance of the effect. We recommend that the finer detail be added about a particular effect where a range exists. For example, in Tables ES 5-1 and 2.4-2 effects on geomorphology are broadly described as “probable, minor to moderate, and medium to long term.” Noise effects are presented in a more informative way (i.e., “pile driving would result in possible and moderate to unlikely and major, and short-term effects”) by pairing the applicable likelihood and magnitude findings.

Spill Risk and Effect Evaluation

Chapter 4 provides a robust discussion of spill planning, prevention, and response procedures as well as a detailed analysis of the likelihood and types of spills that may occur during the life of the Project. However, the discussion of spills throughout Chapter 3 is inconsistent and often overstates the likelihood and potential effects of such an event. We recommend that spills be addressed with greater consistency and the accidental and unplanned nature of a spill be emphasized in Chapter 3. Each subsection should have a consistent structure that begins with a statement that “spills are unplanned, accidental events.” Then the types of spills that are relevant to the resource should be identified, followed by a discussion of how the spill could affect the resource. Discussions should reflect the fact that spills are not routine effect-producing factors, but are accidental events, and more accurately convey the likelihood of effects occurring.

Each resource section in Chapter 3 includes a conclusion regarding the probability of an effect from a spill, but this analysis is premised on an unlikely event, i.e., a spill occurring, without acknowledging that the precipitating event is, itself, unlikely. Presenting the information in this way overstates the potential for the impact. For example, the summary of potential spill effects on terrestrial mammals states: “Overall, effects from oil spills and accidental releases on



terrestrial mammals and their habitat would be possible (depending on the location and season of the spill), minor to major, and short to long term for a large spill and short to medium term for a very small to small spill,” without acknowledging that the likelihood of that spill occurring in the first place is very low. Similarly, potential effects of a spill are repeated in the Summary of Effects tables (e.g., Tables 3.4-4, 3.8-13, 3.9-9, and 3.10-11) without the context of the likelihood of a spill occurring. We request that the descriptions and summaries of potential effects from a spill include the possibility of that spill occurring (i.e., the likelihood of effects from a large to very large spill would be unlikely for all evaluated resources) to avoid overstating the potential for an impact.

We request clear definition and consistent use of the terms “environmental risk” and “spill risk” in Chapters 3 and 4. Both of these terms appear in Chapter 3 and the term “risk” appears throughout the DEIS without clear reference to the type of risk that is being discussed. The discussion of potential differences in “environmental risk” associated with potential spills and releases among alternatives provided in Section 3.1.5 provides a useful introduction to the topic. However, the remainder of Section 3.1.5 and Table 3.1-2 present conclusions about “environmental risk” in the absence of appropriate context of the likelihood of a spill occurring (currently defined as “spill risk”) and are out of place for an introductory section. This information would be more appropriate in Chapter 4.

Gravel Sources

We request that the FEIS clearly define how it characterizes gravel extraction for the NEPA review and consistently apply that approach in all environmental consequences sections. Specifically, Armstrong submits that gravel extraction that may take place at third-party mine sites (the ASRC Mine Site and the North Slope Borough Mine Site F) does not fall within the definition of “connected actions”¹ and should not be treated as such.

The third-party mine sites from which Armstrong proposes to obtain gravel will be operated independent of the proposed Project. Neither of the third-party mine sites is dependent on the Project to move forward, and the Project is not dependent on either of them. Permit applications for expansions at both the ASRC Mine Site and Mine Site F have been submitted to USACE² and the purpose and need statements for both projects reflect the need for gravel for industrial and local needs across the North Slope, not specific to any project. Therefore, because the third-party mine sites have independent utility, they are not properly considered “connected actions.” We recommend that the evaluation of gravel mining at the third-party mine sites be restricted to the cumulative effects analysis for each resource.

Traditional Knowledge

Armstrong appreciates the inclusion of traditional knowledge shared by the community of Nuiqsut in the DEIS. We recommend aligning the two definitions provided for Traditional Knowledge on page 3-11 to help the reader better understand how the term is being used within the context of this document. In addition, we request that additional context relative to location and time period be provided for each traditional knowledge quote to communicate the relevance

¹ As defined in 40 CFR 1508.25(a)(1), “Actions are connected if they: (i) Automatically trigger other actions which may require environmental impact statements. (ii) Cannot or will not proceed unless other actions are taken previously or simultaneously. [or] (iii) Are interdependent parts of a larger action and depend on the larger action for their justification.”

² POA-1996-869-M11 and POA-2017-422, Kalubik Creek



of each quote to the specific analysis area versus describing observations regarding resources within the larger project vicinity.

Cumulative Effects

The cumulative effects methods in Section 3.1.1 do not clearly describe how the spatial context of past, present, and reasonably foreseeable future actions (RFFAs) is determined for the document globally, nor does it fully describe how the context may change for specific resources. This results in under-defined and unclear evaluations of cumulative effects for specific resources throughout Chapter 3. We have a number of suggestions to improve the analysis of cumulative effects in the FEIS.

First, we recommend clearly defining the spatial area considered for cumulative effects in all sections by first describing the three general spatial extents described in Chapter 3.1 and displaying these spatial extents in Figure 3.1-1.

Second, we ask that the spatial extent of the cumulative effects analysis be stated for each resource, either in Chapter 3.1 or in the discussion of cumulative effects in each resource section. This information is not clearly provided in the Air Quality; Cultural Resources; or Human Health and Safety sections. Furthermore, cumulative effects described in Geology, Permafrost, and Soils; Wetlands and Vegetation; Marine Mammals; and Visual and Aesthetic Resources do not appear to be limited to the stated analysis area.

Third, we recommend identifying which past, present, and RFFAs are located within each cumulative effects analysis area considered for each resource. Adding a column to Table 3.1-1 that lists the resources potentially affected would better communicate the spatial context of the cumulative effects analysis area and the actions that are considered in each of the resource sections of Chapter 3. Some resource sections, particularly Terrestrial Mammals and Marine Mammals, make vague or general statements regarding future development (i.e., expansion south of the Project and the Colville River Delta, and expansion of oil and gas development along the Arctic coast on both land and sea) that do not appear to reference any specific action identified in Section 3.1. We recommend connecting statements regarding potential effects of future actions to specifically identified RFFAs or deleting these speculative statements.

Subsistence

Subsistence was identified as a key issue for this NEPA review, and we appreciate the detailed analysis of this topic provided in the DEIS. However, we are concerned that the methodology used to describe potential effects on subsistence relies heavily on overlapping subsistence use area data. As a result, it does not clearly communicate where caribou subsistence use occurs relative to action alternative facilities or provide the reader with a meaningful and nuanced understanding of potential effects.

We recommend that the harvester importance impact criteria take into account more than just the number of overlapping subsistence use areas that occur within 2 miles of proposed project facilities. Specifically, we request consideration of high, medium, and low overlapping use areas potentially affected by the Project within the context of other available high, medium, and low overlapping use areas in the community's total use areas. Over three-quarters of the "Subsistence Project Area" appears to be in areas of low to moderate overlapping use for caribou harvest. Additionally, areas of high overlapping use within 2 miles of proposed project facilities represent a small percentage of the high overlapping use areas for the community as a whole and are almost entirely located in areas outside of the Project footprint.



In addition, we recommend that the harvester importance impact criteria be revised to incorporate the "harvest" aspect of use. The quantity of harvest and the frequency (or regularity) of harvest from a given area is an important component of use of an area. This information should be incorporated into the criteria used to evaluate harvester importance and ultimately used to identify potential effects upon such use. We recommend a more comprehensive review and use of the Nuiqsut Caribou Monitoring Reports Years 1 through 7.³ These reports include substantial qualitative and quantitative information that should be incorporated into the FEIS.

We recommend that the environmental consequences analysis provide a more robust discussion of what types of effects could occur. This analysis should be informed by available information regarding patterns of use around existing infrastructure as well as current patterns of use near the proposed Project. The Nuiqsut Caribou Monitoring Reports and Alaska Department of Fish and Game data^{4,5} indicate that "caribou harvest amounts have remained relatively stable over time."⁶ The Nuiqsut Caribou Monitoring Reports also provide substantial information regarding the types of facilities and activities that subsistence harvesters report as affecting harvest activities. The reports also document both continued high overlapping use areas adjacent to existing facilities such as Alpine and harvest from such areas. Armstrong requests that USACE use this available information to provide additional discussion of how proposed project design features may influence potential effects and to further inform a meaningful comparison of alternatives.

Socioeconomic Benefits

Socioeconomics was a primary issue identified during scoping. However, the DEIS does not fully and accurately communicate the beneficial effect to the State of Alaska, the North Slope Borough (NSB), and the community of Nuiqsut likely to result from development of the Nanushuk Project, including the strong beneficial link between the oil and gas industry and government provided services and infrastructure.

The DEIS identifies minor to moderate benefits to Alaska Native Claims Settlement Act (ANCSA) corporations, Nuiqsut, the NSB, and the State as a result of the Project. However, the DEIS findings do not consistently recognize the effects that the Project would have relative to the current downward trends in employment, income, and revenue being experienced by many of these entities. As stated in the DEIS section, the Project would result in stabilization of these negative trends. This stabilization would result in changes outside of normal limits and trends (from downward trend to stable trend), resulting in a moderate (modest) to major (substantial) beneficial effect.

Hydrology

The analysis and effects findings in the hydrology section do not take into account the full proposed action, which includes design criteria, BMPs, and Applicant-proposed mitigation to

³ SRB&A. 2010 through 2016. Nuiqsut Caribou Subsistence Monitoring Project: Results of hunter interviews and household harvest surveys. Prepared for ConocoPhillips Alaska, Inc. Anchorage, AK.

⁴ Brown, C.L., N.M. Braem, M.L. Kostick, A. Trainor, L.J. Slayton, D.M. Runfola, E.H. Mikow, H. Ikuta, C.R. McDevitt, J. Park, and J.J. Simon. 2016. Harvests and uses of wild resources in 4 Interior Alaska communities and 3 Arctic Alaska communities, 2014. ADF&G Division of Subsistence, Technical Paper No. 426.

⁵ Braem, N.M., S. Pedersen, J. Simon, T. Kaleak, D. Koster, P. Leavitt, J. Patkotak, P. Neakok,. 2011. Monitoring of annual caribou harvests in the National Petroleum Reserve in Alaska: Atqasuk, Barrow, and Nuiqsut, 2003-2007. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 361. Fairbanks.

⁶ SRB&A 2016.



avoid or mitigate effects on hydrology. The section instead presents a number of worst-case scenarios that are not reflective of all the information available to conduct the analysis or, in some cases, assumes failure of the measures proposed. NEPA requires USACE to analyze reasonably foreseeable effects, not a “worst case” analysis.⁷ Thus, the FEIS should focus its analysis on the effects of the Project as proposed, taking into account the application of design criteria, BMPs, and mitigation.

The analysis also relies on past occurrences on the North Slope to justify the current findings. For example, the discussion of gravel roads and culverts repeatedly makes general statements that wash-out of culverts and overtopping of roads has occurred on the North Slope in the past to justify assertions that these occurrences are possible in the future. However, no consideration is given as to whether those past instances involved infrastructure that were designed using criteria similar to that of the Project, were located in areas of similar hydrologic conditions, and/or were properly maintained. The effect findings also repeatedly justify a major impact finding by stating that rehabilitation might be required while providing no analysis of the likelihood of this being the case.

This Project is being designed with criteria and BMPs that reflect the improvements made in Arctic engineering over the last 50 years. These measures have been incorporated into the proposed action and several are designed to avoid or mitigate effects to hydrology. Therefore, we request that the hydrology analysis in the FEIS reflect the proposed Project inclusive of these measures. Also, if historical occurrences are used to support the analysis, we request that they be placed into the correct context with additional information provided as to their applicability to the current proposed action.

Wetlands and Vegetation

The use of two different analytical methods in the wetlands section creates difficulty for the reader in determining how to weigh information produced by each method. We are concerned that the “East Analysis Area” (East AA) is too large to provide meaningful information about the effects resulting from relatively small amounts of fill associated with potential improvements or upgrades of existing roads in that area. We recommend substantially reducing the East AA to focus on wetland areas within immediate proximity to the roads considered for upgrade. Alternatively, we recommend that evaluation of effects to areas along existing roads could be more appropriately addressed using a qualitative evaluation with acknowledgement for uncertainties that remain in the absence of more detailed data. The inclusion of National Wetland Inventory-based data in the East AA to conduct quantitative analysis of the relatively small amount of fill anticipated in the East AA does not add meaningful value to the DEIS effect analysis.

If the East AA is maintained and used for quantitative evaluation in the FEIS, then the methods used to map and assess it should be clearly explained. Data used for evaluation of the “West Analysis Area (West AA)” is well supported by the Vegetation, Wetland, and Waterbody Mapping Summary and Aquatic Site Assessment (ASA) Summary reports prepared by Armstrong. However, it is unclear from the Wetlands Technical Memo in Appendix VII⁸ whether the mapping attributes and additional data layers used in Armstrong's ASA were developed for the East AA and, if developed, how they were used to identify performance of wetland function.

⁷ *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 355 (1989).

⁸ DOWL. 2016b. Wetlands methods memorandum. Anchorage, Alaska.



As a result, it is not possible to evaluate the technical accuracy of the East AA assessment method or evaluate if and how performance of function in the two areas is comparable.

Finally, we recommend that magnitude be described for all potential effects to inform the reader of potential effect context and intensity. We recommend that magnitude be defined and described qualitatively where quantitative evaluation is not used.

Wildlife

The discussions of birds, terrestrial mammals, and marine mammals in the DEIS are not well organized and sources are not consistently provided. This results in conclusions that are not clearly supported by the information presented. For example, the discussion of climate change and cumulative impacts in the marine mammals section is scattered throughout the direct effects analysis, rather than clearly identified in a separate cumulative impacts analysis, as is done in other sections of the DEIS. There are instances in the wildlife sections where information is presented without a reference citation. Alternatively, multiple citations are provided for general statements without acknowledging the nuance provided in and differences between the individual studies.

Further, we recommend providing a clear description of spatial extent within each conclusion regarding potential effects. Additionally, discussion of impacts to caribou would benefit from a broader look at the body of relevant literature to avoid overly conservative conclusions regarding effects to caribou that are not supported by the literature.

Finally, while regulatory requirements, project design features, and proposed mitigative measures are acknowledged, effect conclusions appear to question the successful implementation of these measures. For example, the analysis of effects to birds resulting from wildlife attraction to project facilities acknowledges that the Project will create and implement a waste management plan and training for employees to minimize attraction, but nevertheless concludes that such impacts could rise to a “moderate” magnitude. We request that the wildlife effects analysis in the FEIS reflect the proposed Project inclusive of BMPs and mitigation measures.

Mitigation

Armstrong provided a list of Applicant Proposed Mitigation Statements, which included avoidance and minimization measures intended to mitigate effects, as part of the DA permit application package for USACE’s consideration in the assessment of environmental effects. Armstrong’s proposed measures were included in the DEIS in Chapter 6 and within each resource section in Chapter 3. However, numerous Applicant-proposed mitigation measures have been edited, and in some cases this rewording has changed the technical meaning. We request that the Applicant mitigative measures in Chapter 6 and Chapter 3 accurately reflect text provided in the Applicant Proposed Mitigation Statements. We also request that Applicant mitigative measures listed in each Chapter 3 resource section incorporate all measures that would reduce effects on each specific resource, such as relocation of DS3 to a suitable location outside of the Colville River floodplain under hydrology. Please see enclosure for specific requests.

Finally, we request that the “Applicant-proposed mitigative measures” referenced in Table 6.3-1 and throughout Chapter 3 be updated to reflect avoidance and minimization measures that were revised to incorporate project updates and submitted to USACE as part of Armstrong’s July 2017 DA Permit Application.



Conclusion

Thank you for considering our comments. Overall, we find the DEIS is comprehensive and complete. We believe our recommendations would further enhance and strengthen the final document.

Sincerely,

A handwritten signature in blue ink, appearing to read 'PHC', with a long, sweeping flourish extending to the right.

Patrick Conway
Permitting and Regulatory Coordinator
Armstrong Energy, LLC

Enclosure

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Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
1	General	N/A	Yes	N/A	N/A	We recommend more careful review of the EIS to ensure the words "would" and "could" are used in a manner consistent with the impacts described. The verb "would" should refer to an impact that is definite within the conditions described (e.g., "infrastructure from the Project would not affect any public transportation system"). In contrast, "could" denotes the possibility of an impact occurring but does not express certainty that it will occur (e.g., "damage to vegetation or soil compaction could result from ice roads and off-road travel"). The word "would" is often used in the DEIS to describe impacts that are described as possible or, in some cases, unlikely. We recommend using "could" to more appropriately and clearly convey the likelihood of the impact occurring.
2	Executive Summary	N/A	Yes	N/A	N/A	There are several instances of inconsistencies between the reported impacts and key findings in the Executive Summary and Section 2.4 versus the more detailed discussion in Chapter 3. For example, bullet 1 under the key findings for geomorphology, permafrost, and soils on page ES-20 paragraph 3 indicates the duration of effects of gravel placement is "long term," but in Table 3.4-4 in Chapter 3 it is listed as "medium to long term." Another example is the key finding for visual and aesthetic resources on page ES-34, paragraph 4 where it lists effects as short to medium term, but several long term effects are identified in Table 3.13-4 in Chapter 3. Inconsistencies also occur between Table ES 5-1 and the analysis in Chapter 3. For example, in the last row in the wetlands and vegetation section on page ES-50, the duration is listed as short term for the effects associated with compaction, but short to medium term in Table 3.8-13. All conclusions and key finding statements in the executive summary need to be reviewed for consistency with the sections in Chapter 3. Specific examples of inconsistencies between Section 2.4 and Chapter 3 are provided in a separate comment.
3	Executive Summary	N/A	Yes	N/A	N/A	During our review of the DEIS, we have made several comments on the specific analysis in Chapters 1, 2, 3, and 4 that, if addressed, would also result in changes to the Executive Summary and other places in the document where findings/impacts are summarized. These may include the comparison of impacts table in Section 2.4 and the "Key Findings and Differentiators" sections for each resource in Chapter 3. In addition, any changes to the impacts for a given resource would need to be made in other resource sections that discuss impacts for that resource (e.g., bird impacts presented in the environmental justice section). Please be sure that revisions are carried through the entire document in all appropriate sections.
4	Executive Summary	N/A	Yes	N/A	N/A	Some of the summaries and conclusions presented in this section are too broad or general for them to meaningfully disclose effects. In some cases, because a summary is presented instead of the detailed analysis, the range of impacts is indicated as "minor to major", "unlikely to probable", and/or "short term to long term." That presents the entire spectrum of potential impacts so does not communicate clear understanding of the extent or significance of the impact. We recommend that the finer detail be added to be more specific about a particular impact, or that terminology not be included in the summary.
5	Executive Summary	ES-6	No	N/A	Table ES 1-1	Table ES 1-1 includes "development within and potential impacts to the floodplain and rivers" as a key issue, whereas Table 1.7-3 does not. Please revise for consistency.
6	Executive Summary	ES-9	No	1	N/A	Recommend acknowledging and explaining evaluation of gravel sources. Gravel extraction is addressed in ES4.2 and elsewhere but proposed gravel sources and introduction to evaluation of gravel in the DEIS is not introduced until ES4.21. For each resource discussion, please address potential impacts of gravel extraction consistently.
7	Executive Summary	ES-9	No	1	N/A	Bullet 8: Recommend replacing "seawater" with "makeup water" consistent with Armstrong's project description and with page 2-12 and 2-38. In addition, please add "makeup gas."
8	Executive Summary	ES-13	No	2, 4	N/A	Recommend replacing word "possible" with "practicable" for consistency with the alternatives development criteria.
9	Executive Summary	ES-17	No	2	N/A	Recommend providing introductory language explaining the development of impact criteria (magnitude, duration, likelihood) for each resource and that criteria may differ between resources based on resource-specific characteristics (i.e., long term in one resource may not refer to the same length of time as long term in another).
10	Executive Summary	ES-17	Yes	3	N/A	For each resource discussion, recommend providing a clear description of the spatial context of the impact. This is currently missing from a number of the key finding bullets. This comment specifically applies to the following: page ES-17, paragraph 3, bullets 1 and 4; page ES-20, paragraph 1; page ES-28, paragraph 4, bullets 1 through 3; page ES-29, paragraph 2, bullet 1; and page ES-30, paragraph 3, bullet 1.
11	Executive Summary	ES-20	No	1	N/A	Recommend revising verb "would" to "could" for consistency with relevant impact findings in Hydrology.
12	Executive Summary	ES-21	No	2	N/A	Please revise to state that air quality on the North Slope is good. Remove the reference to the relatively few numbers of emission sources.
13	Executive Summary	ES-25	No	2	N/A	Recommend changing "would" to "could" in this paragraph for consistency with "possible" findings below.
14	Executive Summary	ES-25	No	3	N/A	Bullet 2: Recommend describing why the number of pipeline-stream crossings is relevant to impacts to water quality as this is not explained by information provided in the paragraphs or key findings above.
15	Executive Summary	ES-26	No	2	N/A	Recommend deleting "and contamination of vegetation soils" as discussion of spills and impacts to vegetation related to spills is addressed in ES-6.
16	Executive Summary	ES-27	No	3	N/A	Recommend providing a spatial reference as to where the CRD and Beaufort Sea are relative to the Project area (adjacent) and/or connect this statement to bird use within the Project area.
17	Executive Summary	ES-28	No	2	N/A	Recommend replacing phrase "gravel deposition" with "gravel fill placement." The word deposition suggests movement of gravel by water and does not describe the intentional placement of gravel fill to construct the proposed Project.
18	Executive Summary	ES-28	No	4	N/A	Please revise phrase "restrict access to traditional use areas" with "alter use of traditional use areas." No restrictions on access to TLUs are proposed.
19	Executive Summary	ES-34	No	4	N/A	The second to last bullet on this page states that the CPF under Alternative 4 is furthest from subsistence use areas along the Colville River. Please revise and/or explain specifically which subsistence uses or use areas are being referred to in this statement. The Alternative 5 CPF is furthest from the Colville River.
20	Executive Summary	ES-35	No	3	N/A	Bullet 4: Recommend providing context that the moderate impact finding is related to drilling and operations traffic noise. Provide additional context regarding existing drilling and operations noise (including regular fixed wing aircraft) at Alpine.
21	Executive Summary	ES-36	No	4	N/A	Recommend revising word "displacement" with "alteration of use."
22	Executive Summary	ES-40	No	1	N/A	Bullets 2 and 3: Recommend clarifying that impacts described are to subsistence harvest of moose and marine mammals, not to the moose and marine mammals themselves.
23	Introduction, Purpose, and Need	1-8	No	2	N/A	Recommend adding a reference to the bridge over the Kachemach River associated with infield roads to bullet 7.
24	Introduction, Purpose, and Need	1-8	No	3	N/A	Development of a new material site is not part of the proposed Project. Because Section 1.2.3 summarizes the Applicant's proposed action, please either delete "if material was not available at these sites, a new site by DS3 would be developed" or clarify in the text that it is not part of the proposed action, but is considered for analysis in the EIS.
25	Introduction, Purpose, and Need	1-9	No	4	N/A	Please insert in the Applicant's stated purpose and need: "...of liquid hydrocarbons in its State of Alaska oil and gas leasehold by..." consistent with Armstrong's July 2017 DA Permit Application. Comment also applies to the Executive Summary, page ES-7, paragraph 4.
26	Introduction, Purpose, and Need	1-10	No	4	N/A	Please explain the reason for including Section 1.3.2, NEPA Purpose and Need, in the DEIS and clarify the difference between the NEPA Purpose and Need and the USACE's Overall Purpose (Section 1.3.4). A NEPA purpose and need is not defined in the list of three ways USACE evaluates the project purpose on page 1-9. The bullets accurately state that the overall reason for conducting a NEPA review is the USACE's overall project purpose, and that the overall project purpose is used by USACE to evaluate alternatives in an EIS. The NEPA purpose and need overlaps or duplicates the overall project purpose, with the only difference between the two is the inclusion of the phrase "to meet the public's need for oil resources." A NEPA purpose and need is not referenced again in Chapter 1 and Chapter 2.
27	Introduction, Purpose, and Need	1-11	No	2	N/A	Armstrong's project purpose and need does not define specific reservoirs whereas the USACE's Overall Project Purpose does. In Section 1.3.4, please either remove reference to the specific reservoirs, or add Armstrong's secondary purpose, which is to further delineate geologic features and hydrocarbon accumulations in Armstrong's leasehold utilizing the proposed infrastructure.
28	Introduction, Purpose, and Need	1-11	No	4	N/A	The USACE scope of analysis under NEPA (33 CFR 325) is not specific to the CWA Section 404(b)(1) analysis. Rather, the text that follows describes USACE's scope of analysis under NEPA. Recommend deleting "CWA Section 404(b)(1) analysis" and replacing with "under NEPA."
29	Introduction, Purpose, and Need	1-15	No	2	N/A	Recommend that Section 1.6 includes a description or definition of "other agencies" to distinguish them from cooperating agencies. Also, please add the U.S. Coast Guard to acknowledge their regulatory oversight of bridges over navigable waters.
30	Introduction, Purpose, and Need	1-22	No	N/A	Table 1.8-1	Please delete EO 13653 as it has been revoked by EO 13783. Year (2017) should be added to EO13783.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
31	Introduction, Purpose, and Need	1-22	No	N/A	Table 1.8-1	Please review and add EO 13807 – <i>Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure</i> (August 15, 2017), if applicable.
32	Alternatives	2-1	Yes	3	N/A	Discussion of purpose and need in Section 2.1 is not consistent with Section 1.3 which describes a "NEPA purpose and need" and an "overall project purpose." Please discuss how each of these is relevant to the alternatives analysis to tie these two sections together. Also see comment on Section 1.3.2.
33	Alternatives	2-4	No	N/A	Inset	Recommend using the same definition for Project footprint here as used in Section 3.1. The definition used here implies a larger area than the area that would be directly occupied by Project infrastructure as physical impacts could occur in the direct Project footprint as well as in an area of indirect effects.
34	Alternatives	2-100	Yes	N/A	2.4-1	The reporting of acreages of fill in WOUS versus total fill for each alternative is confusing and implies a level of information regarding the jurisdictional status of areas along existing roads that is not yet known. Recommend stating the total acreage of fill in the introduction for each alternative (Sections 2.3.3, 2.3.4, 2.3.5, and 2.3.6) and, if required, stating that the majority would occur in WOUS.
35	Alternatives	2-5	No	N/A	Table 2.2-1	The statement under Options 6B, 6C, and 6E that these options would substantially increase the Project footprint is not supported by the analysis presented in Appendix III. Please revise or delete.
36	Alternatives	2-6	No	N/A	Table 2.2-1	Under Option 6D, add "with airstrips" to the "Option Description" column.
37	Alternatives	2-6	No	N/A	Table 2.2-1	Under Rationale for Elimination for Option 6F, please add bullet stating: "It would create more adverse effects in terms of spill detection and spill response," as spill detection and response is a consideration for all roadless options.
38	Alternatives	2-7	No	N/A	Table 2.2-1	Please clarify whether Option 7E includes only two drill sites. The Option Description does not indicate only two drill sites but the rationale for elimination states that "use of two drill sites would require well lengths in excess of 45,000 feet to produce the Project's target resources."
39	Alternatives	2-8	No	N/A	Table 2.2-1	For Option 10B, change bullet to read, "Transporting multiphase product to CPF2 for processing would require additional and larger pipelines with the potential for severe pipeline slugging. In addition, the Kuparuk CPF2 is at or near capacity limits for gas treating and gas compression, produced water, water injection, total inlet fluids, and electrical production and therefore would require expanding the plant at a scale similar to the Nanushuk CPF."
40	Alternatives	2-8	No	N/A	Table 2.2-1	For Options 9C and 9D, recommend changing "technologically feasible" to "technologically practicable."
41	Alternatives	2-9	No	N/A	Table 2.2-1	Suggest revising the rationale for eliminating Option 11C. Gravel mining from the floodplain already occurs at the ASRC Mine Site, which is a site proposed for use by the Project. Our understanding of Alternative 11C is that it focuses more on mining gravel from the river bed itself, not the floodplain.
42	Alternatives	2-12	No	5	N/A	Bullet 5 in Section 2.3.2: delete "import" from "export/import." The sales oil pipeline is only export. Insert "makeup gas" after "makeup water."
43	Alternatives	2-19	No	3	N/A	Insert "initial gravel placement for" at the beginning of the last paragraph in Section 2.3.2.1.
44	Alternatives	2-19	No	4	N/A	Insert "subsurface" between "prevent" and "interference."
45	Alternatives	2-21	No	3	N/A	First sentence: recommend changing "would" to "may" as the location of construction camps is subject to change. Construction personnel may be housed in one main camp or several construction camps depending on a number of factors.
46	Alternatives	2-22	No	2	N/A	Revise first sentence as follows: "If space on a gravel pad for a pioneer camp is not available or within reasonable proximity to the selected mine site, then an ice pad would be constructed to house the off-site pioneer camp..."
47	Alternatives	2-34	No	3	N/A	In the sentence, "Additionally, helicopters may be used in the event of health and safety emergencies; however, routine helicopter use is not planned under normal operating conditions," recommend adding the phrase "over the life of the Project" following "emergencies" to indicate that helicopter use could occur in any phase.
48	Alternatives	2-35	No	3	N/A	The permit process for expansion of the ASRC Mine Site is not a "connected action" to the proposed Project because ASRC has multiple potential buyers for gravel produced from the Mine Site, and the development of the Mine Site is not dependent on the Nanushuk Project.
49	Alternatives	2-38	No	2	N/A	Please add the following bullet: "A gas injection pipeline to transport excess gas to dedicated injection wells at the drill sites."
50	Alternatives	2-50	No	1	N/A	First sentence, change "possible" to "practicable."
51	Alternatives	2-80	No	4	N/A	Update the number of road turnouts from four to one.
52	Alternatives	2-82	No	1	N/A	Update the number of road turnouts from two to five.
53	Alternatives	2-92	No	4	N/A	Update road turnout number to three.
54	Alternatives	2-93	No	2	N/A	Update road turnout number to three.
55	Alternatives	2-97	Yes	4	N/A	Table 2.4-2 introduces impact criteria terminology prior to introduction of impact methodology in Section 3.1. Recommend adding a short explanation of impact criteria terminology and explanation that criteria are defined differently for each resource e.g., long term for one resource may be a different length of time than a second resource). This may help clarify potentially non-intuitive impact findings.
56	Alternatives	2-101	No	N/A	Table 2.4-2	This table does not describe how the listed quantifiable differences between alternatives relates to the identified impacts. For example, on page 2-103 the second row of the table states "Effects on channel stability or alignment from road and bridge infrastructure would be possible, moderate to major, and medium to long term". However, the comparison of alternatives only identifies numerical differences between the alternatives and not whether those differences would be expected to account for the identified variations of magnitude or duration of the effects. We recommend the table be revised to describe how the potential effects would be expected to vary among alternatives.
57	Alternatives	2-101	No	N/A	Table 2.4-2	Please review the impact findings stated in Table 2.4-2 to ensure consistency with findings in Chapter 3. Several instances of inconsistencies between Table 2.4-2 and Chapter 3 occur: Row 2 for Geomorphology, Permafrost, and Soils on p. 2-101 states likelihood of impacts from placement of gravel as possible and duration as long term; Table 3.4-4 lists likelihood as "probable" and duration as "medium to long term." Row 1 for Geomorphology, Permafrost, and Soils on p. 2-102 identifies likelihood of effects of drilling, production, and waste injections probable, but in Table 3.4-4, likelihood is possible in the "drilling and operations" row. Last row in Wetlands and Vegetation on p. 2-104 lists duration of effects of compaction as short term; Table 3.8-13 identifies duration as short term to medium term. Row 2 under Terrestrial Mammals on p. 2-105 - duration of "habitat alteration from dust,..." is listed as short term; Table 3.10-11 identifies duration as long term. Row 8 under Fish and Invertebrates on p. 2-107 lists noise effects as long term; Table 3.12-7 identifies duration as short term. Row 2 under Marine Mammals on p. 2-106, "loss of designated polar bear critical habitat near gravel infrastructure..." does not appear in Table 3.11-9.
58	Alternatives	2-102	No	N/A	Table 2.4-2	In some cases in Table 2.4-2, impact findings from resource sections of Chapter 3 are grouped and presented such that only the highest impacts are provided. Please revise to ensure a consistent approach to how impacts to each resource are presented in Table 2.4-2. Examples include: Row 1 under Fish and Invertebrates on p. 2-107 groups two impact summary rows from Table 3.12-7. Direct loss of habitat from water withdrawal is listed as possible in Table 3.12-7 but is presented as probable in Table 2.4-2. Row 7 under Fish and Invertebrates on p. 2-107- Stormwater runoff and snow removal activities are grouped together, but they are presented separately in Table 3.12-7. Effects of snow removal are identified as short term in Table 3.12-7 but are presented as long term in Table 2.4-2.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
59	Alternatives	2-103	No	N/A	Table 2.4-2	Under Hydrology and Floodplains, the quantities presented for lake water withdrawals are the same as those presented in Table 2.4-1 for total water consumption (including lake withdrawals, seawater use, and water transported to the site from Deadhorse). Please correct these numbers so they are consistent with the total freshwater withdrawal data in Table 3.12-8. Same comment applies to the lake water withdrawal volumes under Water Quality, Wetlands and Vegetation, and Fish and Invertebrates.
60	Alternatives	2-104	No	N/A	Table 2.4-2	In Wetlands and Vegetation, please add a magnitude to the impact finding regarding invasive and non-native species and for the compaction of soil from ice roads and pads for consistency with other impact findings.
61	Alternatives	2-105	No	N/A	Table 2.4-2	In Birds, recommend noting that there are no planned helicopter trips during drilling or operations under Alternatives 2, 3, or 5 rather than just during operations as stated.
62	Alternatives	2-109	No	N/A	Table 2.4-2	Subsistence impact findings in Table 2.4-2 on p. 2-109 are grouped in some cases (especially caribou) such that only the largest impact is presented. For example, impacts to caribou are grouped for all impact types and Project phases but only the "probable" likelihood is presented, losing the "possible" likelihood of impacts to caribou harvester access or resource availability during drilling and operations. In other cases (e.g., furbearers and small land mammals) impacts are presented separately for impact types or phases where differences exist. Please revise for consistency in approach and present ranges of impacts where differences exist.
63	Alternatives	2-109	No	N/A	Table 2.4-2	Please correct the bullet in Subsistence, Alternative 2, which states "Miluveach River crossing further upriver (more impact)" for consistency with the same bullet in the other alternatives which states "Miluveach River crossing further downriver (more impact)."
64	Alternatives	2-110	No	N/A	Table 2.4-2	In Socioeconomics, please explicitly state that benefits on employment, income, increased revenues, and community and social characteristics would be positive.
65	Alternatives	2-110	No	N/A	Table 2.4-2	The impact in the Contaminated Sites row indicates, "Likelihood of encountering existing contamination near Project facilities or activities would be very low to low." This is inconsistent with the conclusions in Section 3.19 for all but Alternative 3, which indicate "very low to moderate likelihood."
66	Introduction and Analysis Methods	3-2	No	3	N/A	NEPA also allows for the use of best available information where data gaps occur for project-specific information. Suggest adding a statement to the end of this paragraph that where project-specific information was not available, best available information was used.
67	Introduction and Analysis Methods	3-4	No	4	N/A	Recommend clearly defining the spatial area of the Lower Colville River watershed and adjacent watersheds along the Oliktok Road, and showing those areas on Figure 3.1-1. As currently written, it is unclear which projects may or may not fall into the spatial areas described and thus why some projects are included in the table of Past, Present, and RFFAs and others are not.
68	Introduction and Analysis Methods	3-4	No	4	N/A	Please clarify how the expanded "Greater Colville River Delta" spatial area of analysis differs from the " Lower Colville River Watershed."
69	Introduction and Analysis Methods	3-6 to 3-8	No	N/A	Table 3.1-1	Recommended changes to Table 3.1-1: 1. Describe the geographic area used to constrain facilities on this list, as it differs from the geographic scope of analysis in 3.1.1.1. 2. Under "Oil and Gas Exploration- NPR-A" recommend listing known projects only. 3. Add Put 23 as a gravel mine. 4. Include SA 10 utilities, water wastewater and landfill. 5. Correct "Dalton Highway Construction" to "Dalton Highway Reconstruction." 6. Description of Pikka Unit exploration should include both Past and Present as well as future. 7. Add a column listing the resources potentially affected. This would communicate the spatial context of the cumulative affects analysis area for each resource and the actions that are considered in each of the resource sections of Chapter 3.
70	Introduction and Analysis Methods	3-9	No		Figure 3.1-1	Recommend correcting errors and inconsistencies with Table 3.1-1 and text in Section 3.1.1.1 including: - The word "Not" in the "Projects Not Shown" box is misspelled. - Remove "Colville River Delta" label as delta feature is not visible under the Pikka Unit shading and appears to be referring to the Unit. - CD-1 and CD-2 are Present Development Projects, not Exploration Projects as shown. - GMT1 is a Present Development Project. - GMT2 is a Reasonably Foreseeable Development Project. - Kuparuk, Palm, Meltwater, and Tarn are Present Development Projects, not Exploration Projects as shown. - Cascade is a Present Development Project, not a Reasonably Foreseeable Exploration Project as shown. - Moose Pad is a Reasonably Foreseeable Development Project, not Exploration Project as shown. - Nikaitchuq is a Present Development Project, not a Present Exploration Project as shown. - Northstar is a Present Development Project, not a Present Exploration Project as shown. - Oooguruk is a Present Development Project, not a Present Exploration Project as shown. - Prudhoe Bay is a Present Development Project, not a Present Exploration Project as shown. - Mustang is a Present Development Project, not a Present Exploration Project as shown. - Table 3.1-1 identifies Putu Exploration as Present but the figure lists it as Reasonably Foreseeable. - Deadhorse Airport is a Present Development Project, not a Reasonably Foreseeable Development Project as shown. - Table 3.1-1 identifies Kuparuk Mine Site B and D as Past Development Projects but the figure lists as Present Development Projects. - Table 3.1-1 identifies Kuparuk Mine Site E as a Past, Present, and Future but the figure lists as a Past Development Project. - Mine Site F is a Past and Reasonably Foreseeable Development Project, not a Past Development Project as shown. - Table 3.1-1 identifies the Liberty Mine Site as a Past and Present Project but the figure lists as a Reasonably Foreseeable Development Project. - Table 3.1-1 identifies the TNSG South Power Plant as Past, Present and Future Project but the figure shows it as a Reasonably Foreseeable Development Project. - Correct spelling of Prudhoe Bay. - Label ANWR. - Label Nuiqsut. - Add Liberty Project. - Remove Qugruk Unit.
71	Introduction and Analysis Methods	3-11	No	4	N/A	Please clarify whether "Local observations and information" are considered Traditional Knowledge under the definition provided in the second sentence of the paragraph and describe why the observations are considered traditional knowledge.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
72	Introduction and Analysis Methods	3-13	No	2	N/A	Section 3.1.5 includes a preliminary assessment of oil spill risks for each alternative. This seems out of place in the introduction section, and is information better suited to the discussion of the risk of spills in Chapter 4. Suggest keeping the first paragraph in Section 3.1.5 and moving the rest of the assessment language to Chapter 4 to replace the last two paragraphs of page 4-38. The alternatives analysis in Section 3.1.5 provides a more detailed assessment of the potentially different environmental impacts of each alternative than the discussion currently on 4-38.
73	Introduction and Analysis Methods	3-13	Yes	2	N/A	Recommend revising the heading title for each subsection in the Chapter 3 resource sections that addresses spills to "Oil Spills and Other Accidental Release." Please also ensure that each subsection begins with "spills are unplanned, accidental events."
74	Introduction and Analysis Methods	3-13	no	5	N/A	The meaning of the first sentence of this paragraph is unclear. Recommend directly stating that the 70 foot and 200 foot buffer distances were generated based on consideration of topography around lakes and streams. Explain why the buffer distance for flowing water is greater than for lakes.
75	Climate Change	3-16	No	4	N/A	Recommend deleting the majority of this paragraph. Description of suspended or rescinded executive orders is inconsistent with the description of the regulatory environment in other resource sections. This paragraph should identify and explain the existing regulatory framework and the relevant federal laws that are discussed later in the section.
76	Climate Change	3-16	No	5	N/A	Recommend explicitly defining the analysis area for climate change. The current definition is too vague.
77	Climate Change	3-17	No	1	N/A	Section 3.1, page 3-1, states that impact criteria were not used for the climate change analysis. However, the text on page 3-25 states that impacts would be "probable" and "long term," but these terms have not been defined in this section and imply impact criteria were used. Either: 1) Delete the reference to climate change on page 3-1 and describe the impact criteria used to evaluate climate change in this section; or 2) State in this section why impact criteria were not used for climate change (i.e., explain the unique or special considerations) and use different terminology than "probable" and "long term" when describing the impacts.
78	Climate Change	3-24	No	4	N/A	This paragraph asserts that Alternative 2 can be used as a proxy for all other action alternatives because "the emissions sources would likely be similar among all action alternatives." This statement should be better supported with a statement that the differences in configurations are not expected to have a measurable difference on GHG emissions.
79	Climate Change	3-25	No	2	N/A	Recommend providing perspective on the GHG emissions in terms of annual global GHG emissions to help provide context for the emissions described.
80	Climate Change	3-25	No	4	N/A	"Additionally, any thaw of permafrost due to Project activities could release GHGs trapped within the permafrost." Recommend revising this statement for clarity as follows: "Additionally, although thawing of permafrost would be minimized through the Project design and mitigative measures, any indirect thaw of permafrost due to Project activities could release GHGs trapped within the permafrost."
81	Climate Change	3-26	No	2, 3	N/A	The discussion regarding modeling and design of the gravel pad and road thickness is misleading and inconsistent with Section 3.4.6.5, which is more accurate. For example, Section 3.4.6.5 acknowledges that the 5-foot gravel road thickness is a minimum and would be increased as needed. Also, Section 3.4.6.5 states "Gravel pads would likely be of sufficient thickness to insulate the underlying permafrost under changing climate conditions, because gravel pads would also contain additional insulating techniques and technologies (e.g., thermosiphons) to prevent thermal subsidence beneath structures and facilities."
82	Climate Change	3-26	No	3	N/A	Recommend revising as follows "Taking into account the topography of the Project area and the Applicant's basis of design, average road and pad thicknesses would be greater than the <u>minimum</u> design thickness in most locations." for accuracy and consistency with other text in the paragraph.
83	Climate Change	3-27	No	5	N/A	Recommend listing only the mitigation measures related to controlling direct GHG emissions, and referring to the specific resource sections for the other mitigation measures. For example, suggest explaining the connections with permafrost loss/contributions to GHG and then referring to the section where the mitigation measures to reduce permafrost impacts are discussed.
84	Geology and Mineral Resources	3-32	No	1	N/A	Recommend adding "deep groundwater" to the sentence, "Authorizations and permits specific to geology and mineral resources would be required from ADNR, AOGCC, and EPA" for clarity.
85	Geology and Mineral Resources	3-33	No	N/A	Table 3.3-2	Under Effects Analysis Methods for Drilling and Hydrocarbon Extraction, please revise bullet 1 to indicate that potential volume of extractable hydrocarbons in the target formations and lease areas are based on processing capacity of 120,000 bopd over the life of the project, not pipeline capacity as stated.
86	Geology and Mineral Resources	3-38	No	2	N/A	Clarify the likelihood of ground acceleration that could cause liquefaction occurring in the analysis area, given its relatively low seismicity. In addition, this section is missing a conclusion as to whether seismicity and liquefaction are a risk for the Project. Recommend addressing this issue either in this section or somewhere in Section 3.3.6 <i>Environmental Consequences</i> .
87	Geology and Mineral Resources	3-41	No	3	N/A	Recommend changing the duration of impacts to paleontological specimens to "medium to long term" consistent with the range of minor to moderate magnitude, which depends on whether specimens are damaged. Comment also applies to Table 3.3-5.
88	Geology and Mineral Resources	3-41	No	4	N/A	Recommend replacing "laterally" with "vertically" in the following sentence: "It would be highly unlikely that deep groundwater injected with waste fluids would travel laterally and intersect surface waters."
89	Geology and Mineral Resources	3-43	No	N/A	Table 3.3-4	Recommend striking the words "bedrock formations" from footnote "b" or else describing in the text the mechanism for a pipeline oil spill to reach bedrock formations, given that bedrock is well below the top of permafrost in the analysis area.
90	Geology and Mineral Resources	3-45	No	4	N/A	The cumulative impacts are overstated in this text, "...it would be unlikely that paleontological resources could be depleted to the point that the resource is lost due to the minor impacts of such projects." Recommend revising to state that paleontological resources would not be depleted to the point that the resource is lost.
91	Geology and Mineral Resources	3-46	No	3	N/A	Please add gravel volume reduction mitigation measure that road widths have been designed, in part, based on the weight and size of vehicles expected to travel on them, with narrower infield roads than access road.
92	Geology and Mineral Resources	3-46	No	3	N/A	Please add gravel volume reduction mitigation measure: Connection to the existing gravel road system allows use of the existing Deadhorse Airport to support field logistics. This eliminates the need for a new project-specific airstrip to transport personnel and associated regular fixed-wing air travel impacts in the Project area. As a result, less storage space is required at each drill site to accommodate required site support materials, fuels, hazardous substances, and solid waste, reducing the overall size of each pad.
93	Geology and Mineral Resources	3-46	No	3	N/A	Please add gravel volume reduction mitigation measure: Seasonal ice pads and roads will be used to support winter pipeline and gravel infrastructure construction, avoiding the need for additional fill to support construction.
94	Geomorphology, Permafrost, and Soils	3-49	No	2	N/A	Please clarify or revise statement "Ice infrastructure, VSMs, and bridge piers are not included in the direct Project footprint, since indirect effects from these Project components would not be expected," so as to avoid confusion between direct and indirect Project impacts. If direct effects are anticipated, then the facilities footprints should be (and, based on Section 3.4.6, are) included in the analysis area. However, the lack of indirect effects warrants not including additional buffers from these facilities.
95	Geomorphology, Permafrost, and Soils	3-52	No	3	N/A	Please clarify "The CRD plain consists of...channels separated by shallow water areas." The CRD consists of a network of distributary channels, between which are lakes and other water features consistent with relatively shallow topography and subject to annual breakup flooding. Hydraulic connectivity is dependent on flood magnitude and ice conditions.
96	Geomorphology, Permafrost, and Soils	3-55	No	1	N/A	"Cryosol/gelisol" is a soil order rather than a soil type. Please also provide a description of the soil types found in the project area (e.g., silt, sand, loam).
97	Geomorphology, Permafrost, and Soils	3-56	No	2	N/A	"Warming temperatures...would be expected to result in an overall drying of the soils during this period, which may reduce the rate of chemical reactions that aid in soil formation." This text is inconsistent with the following text on page 3-55 which suggests that warmer temperatures should have the opposite effect on soil formation due to chemical processes: "Chemical weathering, which allows nutrients contained within the mineral fragments of the soil to become available for use by vegetation, is limited due to climatic conditions on the North Slope. This limits nutrient availability for vegetation compared with more temperate regions." Recommend clarifying.
98	Geomorphology, Permafrost, and Soils	3-56	Yes	3	N/A	The last sentence of the paragraph describes a predicted negative effect of warming temperatures, but provides no citation or data to support the prediction.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
99	Geomorphology, Permafrost, and Soils	3-56	No	4	N/A	Delete sentence: "This could heighten any permafrost melting initiated by impacts from the Project." This section is intended to address the affected environment. Statements regarding impacts of the proposed Project in conjunction with climate change are appropriate in discussion of cumulative impacts.
100	Geomorphology, Permafrost, and Soils	3-57	No	2	N/A	Please delete phrase "and the Project." According to Section 3.1 (page 3-11) Traditional Knowledge is "information about skills, practices, or the environment that are passed down from generation to generation." Based on that definition, it is unclear how or why any traditional knowledge could relate to a project that has not yet been built.
101	Geomorphology, Permafrost, and Soils	3-57	No	4	N/A	Bullet 1 in Section 3.4.6.1: Please revise bullet to clearly differentiate the likelihood of impacts to soils (probable) versus permafrost (possible) within the footprint of gravel fill placement. Possible impacts to permafrost are supported by paragraph 2 of page 3-59 which states: "The Applicant's mitigative design features are anticipated to be sufficient to prevent thawing beneath the pads, and timely maintenance to sections of road that experience thaw settlement may reduce the effects of thermokarsting beneath them."
102	Geomorphology, Permafrost, and Soils	3-59	No	2	N/A	Recommend adding "without planned monitoring and maintenance" to the sentence that states "Forecasts of climatic warming and thermal modeling indicate that the planned minimum road thickness of 5 feet may not be sufficient to prevent thaw beneath road sections throughout the life of the Project (MBI 2016a)" to more accurately reflect the conclusions and recommendations in the referenced Project Note.
103	Geomorphology, Permafrost, and Soils	3-59	No	2	N/A	Please revise average road and pad thicknesses to 6.5 feet and 9 feet respectively.
104	Geomorphology, Permafrost, and Soils	3-64	No	3	N/A	Please revise likelihood of major impacts of a large spill. A large spill <i>and</i> subsequent impacts to geomorphology, permafrost and soils related to that large spill would be unlikely, not unlikely to possible, as stated.
105	Geomorphology, Permafrost, and Soils	3-64	No	multiple	N/A	It is unclear why spills are addressed in two separate sections, 3.4.6.3.7 and 3.4.6.3.8. This results in inconsistency relative to the determination of impacts. Recommend combining these two sections (see Section 3.6.6.3.6 for example) and eliminating redundancy and inconsistency. Alternatively, Section 3.4.6.3.8 could be limited to spills of produced fluids and processed sales-quality hydrocarbons that may occur at oil wells, pipelines, and aboveground storage tanks (see Section 3.7.6.3.12 for example) and Section 3.4.6.3.7 could address all other spills. Additionally, the findings in Section 3.4.6.3.7 are based on the spill risk described in Chapter 4, but repeated without reference and contain inconsistencies (i.e., a large spill with major impacts would be unlikely, not unlikely to possible as stated).
106	Geomorphology, Permafrost, and Soils	3-65	No	3	N/A	Please provide the likelihood of both small and large pipeline spills occurring. In addition, please clarify whether the likelihood is being considered for on-pad piping (i.e., process or facility piping) or off-pad pipelines (infield and export pipelines). The finding of "possible" impacts related to pipeline spills is inconsistent with the Low to Very Low likelihood probability of a spill occurring for infield and export pipelines identified in Chapter 4.
107	Geomorphology, Permafrost, and Soils	3-65	No	4	N/A	Recommend revising to state "in the very unlikely event of a catastrophic pipeline failure" to reflect findings in Chapter 4 that a complete guillotine break in a pipeline has never occurred on the North Slope and would have a very low probability of occurring.
108	Geomorphology, Permafrost, and Soils	3-66	No	3	N/A	Recommend adding language to acknowledge that mine site reclamation can result in creation of new geomorphic features, which may have benefits to wildlife. Section 3.4.6.3.9 discusses only adverse impacts of gravel mines on geomorphologic features (i.e., "destruction of geomorphic landforms").
109	Geomorphology, Permafrost, and Soils	3-67	No	N/A	Table 3.4-4	Please remove "storage, use, and transport of waste and hazardous materials" and "oil spills and accidental releases" or substantially revise these findings to include both the likelihood of a spill occurring <u>and</u> the likelihood of that spill affecting the physical substrate. As written, the likelihood of potential effects is overstated (impacts to the physical substrate from a large to very large spill is not probable as it is very unlikely that a large spill would occur).
110	Geomorphology, Permafrost, and Soils	3-68	No	3	N/A	Please clarify whether cumulative impacts described are specific to the defined analysis area for cumulative impacts for geomorphology, permafrost, and soils. Section 3.4.6.5 states that thousands of acres of gravel pads and roads have been developed and describes future development west of the CRD in the NPR-A (page 3-69, paragraph 2). It is not clear that either of these statements is specific to the Lower Colville Watershed and adjacent watersheds along the Oliktok Road. Recommend focusing description of past, present and reasonably foreseeable future actions to those that have or are expected to occur in the analysis area described.
111	Geomorphology, Permafrost, and Soils	3-69	No	2	N/A	The following statement, "The Project would incrementally add to these existing infrastructure-related impacts by approximately 300 acres, despite efforts to collocate facilities, share roads, and minimize facility footprints" implies that efforts to reduce the Project footprint have been in vain, when in fact, rigorous engineering and design, along with mitigation measures have resulted in a reduction of approximately 170 acres of fill from the original plan. Recommend revising to "The Project would incrementally add to these existing infrastructure-related impacts by approximately 300 acres. This area has been reduced to the extent practicable by collocating facilities, sharing roads, and minimizing facility footprints."
112	Geomorphology, Permafrost, and Soils	3-70	No	2	N/A	Please revise the "Applicant's Mitigative Measures" to more clearly reflect the Applicant's Proposed Mitigation Statements provided in the July 2017 DA Permit Application Package. These include: p. 3-70, bullet 13 - revise to "Discharge of domestic wastewater to the tundra at the project site is not planned during normal conditions..." p. 3-71, bullet 1 - revise to "Orient drill sites with the long axis parallel to the prevailing northeast/southwest wind direction to minimize snow drift and related maintenance activities..." p. 3-71, bullet 6 - add "to the extent practicable" after "design roads perpendicular to the general flow direction." Also, add "Layout design also considers the effects of spring breakup."
113	Air Quality	3-73	No	3	N/A	Please amend the third sentence in Paragraph 3 on page 3-73 as follows for clarity. " The necessary An air quality construction permits would be issued by ADEC...". The Alaska Department of Environmental Conservation (ADEC) uses the term "construction permit" in reference to a PSD permit. ADEC describes air permits that are issued pursuant to Title I of the Clean Air Act for a minor stationary source (i.e., a source that is not a PSD major source) as a minor air quality control permit. As written, a reader familiar with ADEC's terminology may infer that the Project will require a PSD permit when, in fact, the Project is anticipated to avoid PSD permitting requirements.
114	Air Quality	3-74	No	N/A	N/A	The definition of "Near-Field Effects" in the sidebar on page 3-74, should be amended to clarify the type of air quality models this term is used to describe. "Effects that have a limited range or narrow dispersion zone; for the air quality <u>dispersion</u> models, these are emission impacts found-estimated within 0 and 31 miles (50 km) of from the source.
115	Air Quality	3-74	No	N/A	N/A	The definition of "Far-Field Effects" in the sidebar on page 3-74 should be edited as follows for clarity. "Effects that have a larger dispersion zone <u>than near-field effects</u> ; for the air quality <u>dispersion</u> models, these are emission impacts found-estimated between 31 and 186 miles (50 and 300 km) from the source.
116	Air Quality	3-75	No	2	N/A	The second to last sentence in Paragraph 2 on Page 3-75, "FLMs are responsible for protecting Class II areas from future air quality degradation," should be removed because it is inaccurate. Ambient air quality in Alaska is managed by ADEC under Alaska Air Quality Control Regulations (18 AAC 50) and the EPA-approved state implementation plan (SIP).
117	Air Quality	3-75	No	N/A	N/A	The sidebar definition of "Class II Area" on page 3-75 should be edited as follows, "Areas of the country that are protected under the CAA but that are identified for somewhat less stringent protection from air pollution damage-degradation than Class I areas, except in specified cases." Degradation, as opposed to damage, is a term more commonly used to describe the deterioration of the environment through depletion of natural resources. The amended description is also consistent with the language used in Paragraph 2 on Page 3-75.
118	Air Quality	3-76	No	N/A	Table 3.5-1	Where the units of measurement differ between the NAAQS and the AAAQS, please consider providing, in parentheses, the corresponding value using the other unit as is done in Table 3.5-8. This format clearly communicates when the NAAQS and the AAAQS are the same.
119	Air Quality	3-78	No	2	N/A	The sentence on Page 3-78, Paragraph 2, should be edited as follows for clarity. "PSD <u>permitting requirements</u> apply to new major sources, or existing sources receiving major modifications in attainment areas."
120	Air Quality	3-78	No	2	N/A	For clarity, recommend using the same nomenclature for describing the NAAQS (e.g., criteria pollutants) or providing a definition of a "regulated new source review pollutant" to remove ambiguity or confusion.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
121	Air Quality	3-78	No	2	N/A	Please edit the following two sentences in Paragraph 2 on Page 3-78 as follows for clarity and accuracy. "PSD increments are an amount of allowable pollution increase in a given area in relation to <u>a baseline existing conditions. Significant deterioration occurs when pollutant concentrations exceed the applicable PSD increment. PSD increments are set at a level that prevents air quality in attainment areas from deteriorating to the extent that the would-exceed NAAQS are not exceeded.</u> "
122	Air Quality	3-78	No	2	N/A	Please amend the text in Paragraph 2 on Page 3-78 as follows for additional context and accuracy regarding how ADEC manages PSD increment consumption. "ADEC manages increment consumption in Alaska through the PSD <u>and minor air quality permit programs. A PSD increment consumption analysis is required for new major sources or major modifications to existing sources. Minor permit applicants are not required to demonstrate compliance with PSD increment consumption per the EPA-approved Alaska SIP.</u> "
123	Air Quality	3-78	No	3	N/A	The discussion of the decision not to aggregate sources should be improved to provide more background regarding the legal framework and rationale for not aggregating the project gravel pads. For example, more information about the federal rule that outlines source determination procedures for the oil and gas industry could be described. Specifically, the rule promulgated a revision to 40 C.F.R. 52.21(b)(6), which clarifies the three criteria used to determine when oil and gas equipment and activities are deemed a single source for PSD air permitting applicability determinations. The three criteria used to define a single source are: 1) the same industrial grouping (defined by standard industrial classification code), 2) under common control of the same person or entity, and 3) located on contiguous or adjacent properties. Equipment and activities in the oil and gas sector are not considered contiguous or adjacent if they are located on sites that are more than ¼-mile of each other, pursuant to 40 C.F.R. 52.21(b)(6)(ii). The discussion should also include cross-references to sections of the EIS in which the potential project configurations are discussed to clearly communicate the proximity analysis.
124	Air Quality	3-79	No	2	N/A	Please edit the following sentence for accuracy. BTEX is an acronym used to refer to benzene, toluene, ethylbenzene and xylenes. "Common HAPs associated with oil and gas operations include benzene, toluene, ethylbenzene, and xylenes (often grouped together and referred to as BTEX), as well as n-hexane and formaldehyde." This comment also applies to sidebar definition of BTEX.
125	Air Quality	3-79	No	N/A	Table 3.5-2	Please change the term "Imminently Dangerous to Life and Health" to "Immediately Dangerous to Life and Health" in the heading of the last column of Table 3.5-2 and in footnote a of Table 3.5-2. The term " <i>Immediately Dangerous to Life or Health (IDLH)</i> " is a standard term used by the U.S. National Institute for Occupational Safety and Health and the Occupational Safety and Health Administration to describe an atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.
126	Air Quality	3-80	No	2	N/A	The sentence starting in Paragraph 2 on Page 3-80 should be amended as follows for accuracy and consistency with the referenced guidance document. "According to FLAG guidance (USFS et al. 2010), any stationary source located greater than 31 miles (50 km) from a Class I or sensitive Class II area is considered to have negligible impacts on all AQRVs <u>if its total SO₂, NO_x, PM₁₀, and H₂SO₄ annual emissions, divided by the distance (in km) from the Class I or sensitive Class II area is less than or equal to 10.</u> "
127	Air Quality	3-80	No	2	N/A	The following sentences at the end of Paragraph 2 on Page 3-80 should be edited as follows for clarity and accuracy. " Because both of these Class II areas are located greater than 31 miles (50 km) away, the proposed stationary-source emissions would have negligible impacts with respect to all AQRVs, based on the quantitative assessment provided in the Air Quality Impact Assessment (AQIA) in Appendix V, and therefore, they AQRVs are not discussed further in the EIS."
128	Air Quality	3-80	Yes	3	Figure 3.5-2	The analysis area for air quality described in Section 3.5.4.1 and shown in Figure 3.5-2 is inaccurately defined as the same area as the model domain used for the dispersion modeling analysis provided in the AQIA in Appendix V of the DEIS. The analysis area is better defined as the general rural and undeveloped areas located on the Arctic Coastal Plain to the north and east of Nuiqsut, west of Kuparuk and south of Oliktok Point, encompassing all action alternatives. Emissions from certain construction activities, such as screeding at Oliktok Dock, sealift module transport, and upgrades to existing roads would occur outside of this area. These activities should be qualitatively addressed in Section 3.5 or an explanation should be provided as to why these activities are not addressed.
129	Air Quality	3-80	No	3	N/A	Please edit the second sentence in Paragraph 3 on Page 3-80 as follows for accuracy and for the reasons provided in the general comment above for Section 3.5.4.1. "The air quality analysis area consisted of <u>encompasses</u> two specific modeled areas <u>used</u> to determine the location of modeled maximum impacts: an 8.4-mile by 9.9-mile area centered on the Project area and a 0.6-mile by 0.6-mile area centered on the community of Nuiqsut (Figure 3.5-2)."
130	Air Quality	3-80	No	3	N/A	Please edit the third sentence in Paragraph 3 on Page 3-80 as follows for accuracy and for the reasons provided in the general comment regarding Section 3.5.4.1. "The total area considered in the model analysis was 84 square miles and encompassed the pad locations (or stationary sources) <u>for the Applicant's Proposed Action</u> action alternatives. " The key findings of the modeling analysis of the Applicant Proposed Action are applicable to all action alternatives. Specifically, all action alternatives would emit air pollutants over the life of the project, but would meet applicable state and federal air quality standards.
131	Air Quality	3-81	No	N/A	Table 3.5-3	Please provide further explanations for the "Possible" and "Probable" Likelihood Impact Categories. The definition of "Possible" is unclear when the phrase "or could be mitigated" is included. For example, the inclusion of the phrase "or could be mitigated" could be interpreted to mean effects would occur but would be mitigated. Additionally, it is unclear whether or not "Probable" effects could be mitigated or if such effects would be unavoidable.
132	Air Quality	3-81	No	N/A	Table 3.5-3	Please provide the rationale for why the emission rate of 40 tons per year (tpy) is used to differentiate minor versus moderate impacts for the Magnitude Impact Categories in Table 3.5-3. For example, under ADEC's minor permitting program, a minor air quality permit is required for the construction of a new stationary source that has the potential to emit more than 40 tpy of NO _x or 40 tpy of SO ₂ .
133	Air Quality	3-83	No	N/A	Table 3.5-4	The following statement in the second bulleted sentence in the second column of Table 3.5-4 should be edited for accuracy because a Modeling Protocol (i.e., a document that describes the modeling approach that will be used before modeling is conducted) was not submitted to EPA or ADEC for approval. "Modeled pollutant impacts only for those pollutants that are triggered by the applicable air quality <u>permitting</u> program using methods consistent with <u>modeling protocols approved by the Alaska Department of Environmental Conservation and EPA dispersion modeling regulations and guidance.</u> "
134	Air Quality	3-84	No	1	N/A	Please amend this sentence as follows to correct an error about the direction of the project from Nuiqsut. "Meteorological data collected in Nuiqsut, approximately 6.5 miles southeast <u>southwest</u> of the Project (at its closest point, DS3), were used to represent the ambient conditions at the Project location."
135	Air Quality	3-88	No	5	N/A	Please remove the reference to Fish Creek in this sentence. Meteorological observations for Fish Creek are not provided anywhere else in Section 3.5 of the DEIS. "Calm conditions are infrequent and were measured in Nuiqsut and at Fish Creek only 0.3% and 3.0% of the time, respectively. "
136	Air Quality	3-90	No	4	N/A	The following sentence starting in Paragraph 4, Page 3-90, "A 2003 NRC study notes that emissions from North Slope facilities result in periodically observable haze and decreased visibility" contradicts information in the 2003 NRC study that is referenced in this sentence. According to the 2003 NRC report, arctic haze is the result of distant rather than local emissions (NRC, Cumulative Environmental Effects of Oil and Gas Activities on Alaska's North Slope, 2003, Page 73). As such, this sentence should be edited for accuracy or removed from the EIS.
137	Air Quality	3-90	No	4	N/A	The second sentence in the fourth paragraph on Page 3-90 should be revised to correct the description of Arctic haze effects that are observed at higher latitudes. Elevation refers to height of a geographic point above a fixed location, such as sea level. "Additionally, widespread Arctic haze, a common phenomenon in polar climates that occurs at higher elevations <u>latitudes</u> , has been attributed to distant emission sources."
138	Air Quality	3-90	No	4	N/A	The following text should be amended as follows for accuracy and to provide additional context regarding the Arctic Haze phenomenon. " Both types of haze have been observed on the North Slope, but there is little information available about the interaction between local and distant air masses and the effects of regional haze on air quality at the Alaska North Slope. Their contaminants have not been well studied. Observations of Arctic Haze have been reported since before 1950, well before oil and gas development activities began on the Alaska North Slope (Raatz 1984). At one time, these activities were suspected of contributing to the Arctic Haze phenomenon, but are no longer considered to be a significant factor (Radke et al, 1984; Shaw, 1995). " Publications included as references are Raatz, W., Observations of arctic haze during the Ptarmigan weather reconnaissance flights, 1948-1961, <i>Tellus</i> , 26B(2), pp. 126-136, 1984; Radke, L.F., et al., Airborne observations of Arctic aerosol, I. Characteristics of Arctic Haze, <i>Geophysical Research Letters</i> , 11: 393-396, 1984; and Shaw, G.E., The arctic haze phenomenon, <i>Bulletin of American Meteorological Society</i> , 76, pp. 2403-2413, 1995.
139	Air Quality	3-91	No	N/A	Table 3.5-8	Please add a column to Table 3.5-8 to provide the percent of the NAAQS/AAQS value that the 2012-2014 average value represents. Because the air quality impact criteria include comparisons of modeled values as a percentage of the NAAQS and AAQS, this would help clearly communicate where criteria pollutants in the existing environment fall on the same scale.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
140	Air Quality	3-92	No	2	N/A	The following sentence should be amended as follows to specify that days with high PM ₁₀ levels occur when there are periods of high winds and no snow or ice is covering the ground. "A review of the 2012 through 2014 Nuiqsut monitoring data (SLR 2013; 2015b; 2015a) revealed that the majority of high PM ₁₀ days occurred during periods of strong easterly winds <u>and no snow or ice was covering the ground</u> , when river bank silt would have been entrained in the air."
141	Air Quality	3-92	No	2	N/A	The third sentence in the second paragraph on Page 3-92 should be revised for clarity. Specifically, the "exceptional events" described in this sentence may have been excluded from the background PM ₁₀ concentration values shown in Table 3.5-8 on Page 3-91. However, such "exceptional events" were not excluded from the background PM ₁₀ concentration values shown in Table 3.5-12 and in the AQIA provided in Appendix V. Consider amending the sentence as follows: "Therefore, these periods were considered "exceptional natural events" for the purpose of the NEPA air quality analysis and were excluded from the background PM ₁₀ concentrations for the Project area shown in Table 3.5-8."
142	Air Quality	3-92	No		N/A	The Draft EIS states that the background data is conservative because it is relatively close to some emissions sources, but notes that the data pre-dates significant new developments. Please clarify that the ambient air background values are still accurately described as conservative because they include local sources such as tailpipe emissions, fugitive dust emissions from vehicle travel on unpaved roads and windborne dust from unpaved roads and riverbeds of the Colville River, emissions from space heating for homes and buildings, and combustion emissions from the local utility. These sources are not present in the Project footprint, and thus the air quality in the Project footprint would be found to be better than the ambient air quality conditions in Nuiqsut.
143	Air Quality	3-94	Yes	N/A	Table 3.5-11	Please add a short discussion in Section 3.5.6.1 of what equipment will be located on which pads and the primary emissions sources on each pad. The references to and significance of the CPF, DS1, DS2, DS3 and Operations Center with respect to the air quality assessment are not well explained when first encountered in Section 3.5.6.1. Also, in Table 3.5-11, it would be helpful to know more about the elements of the project that cause the expected emissions to be higher at some locations than others.
144	Air Quality	3-94	No	1	N/A	Please clarify the following statement provided in the first sub-bulleted sentence of the sixth bulleted item on Page 3-94, "the air quality impacts on Nuiqsut were conservatively modeled at the lesser distance...". This sentence implies the air dispersion modeling was conducted using the Alternative 3 CPF location, which is referenced earlier in the sentence as being located the closest to Nuiqsut. This is not accurate based on the text provided on Page 3-95.
145	Air Quality	3-95	No	5	N/A	Please provide the rationale for why Alternative 2 is a suitable, conservative proxy for the fugitive dust analysis. The rationale that Alternative 2 would have the second largest gravel footprint and only about one acre less than the total gravel footprint for Alternative 3, the largest gravel footprint, is not clearly explained in the text.
146	Air Quality	3-97	No	2	N/A	Please amend this sentence as follows to provide the basis for why a 75% control efficiency factor was assumed for fugitive emissions from unpaved surfaces. According to <i>Control of Open Fugitive Dust Sources</i> , EPA 450/3-88-008, U.S. EPA, 1988 and <i>Fugitive Dust Handbook, Rev. 6.1</i> , Western Regional Air Partnership's (WRAP), 2006, a 75% dust control efficiency is indicated for watering activities that double the moisture content of gravel roads, as compared to the moisture content of uncontrolled gravel roads. "During the summer months (June through September), disturbed areas would be watered periodically to minimize fugitive dust emissions, and as such, a control efficiency factor of 75% (i.e., a 75% reduction over uncontrolled emissions) was assumed for estimates of PM emissions (EPA 1988, WRAP 2006)."
147	Air Quality	3-98	No	4	N/A	Please amend the sentence in paragraph 4 on Page 3-98 as follows because an actual air permit limiting the hours of operation of the well stimulation equipment has not yet been issued. Based on the Project plan, it is anticipated that each well stimulation engine will operate, on average, no more than 1,440 hours per year. "Each engine used for <u>hydraulic fracturing well stimulation activities</u> at DS1, DS2, and DS3 <u>would have an operating limit equal to is anticipated to operate, on average, no more than 1,440 hours per year.</u> "
148	Air Quality	3-98	No	5	N/A	Please delete this paragraph as it is a nearly direct repeat of the paragraph on Page 2-20 but contains some errors. If this paragraph is retained, please replace "hydraulic fracturing equipment" with "well stimulation equipment" and "Drill sites would also include space for a temporary camp," with "Drill sites would also include space for temporary camps" for consistency with the description on Page 2-20.
149	Air Quality	3-99	No	N/A	Table 3.5-11	Please edit the title of Table 3.5-11 to clarify that the values shown in the table are maximum "Potential to Emit" values for the Project stationary sources used to assess air permit applicability. Table 3.5-1. Maximum Drilling and Operations <u>Potential to Emit Pollutants Emissions</u>
150	Air Quality	3-100	No	1	N/A	Please amend the second sentence as follows for clarity regarding venting versus flaring. "Flaring rather than venting is generally preferable, in terms of both safety and air pollutant emission consideration, for releasing where un- <u>combusted hydrocarbon gas streams are released to the atmosphere.</u> "
151	Air Quality	3-101	No	3	N/A	Please edit the sentence in Paragraph 3 on Page 3-101 for clarity and accuracy. "The analysis included the evaluation of the cumulative <u>contribution of emissions operating emissions contribution</u> from existing and RFA sources to existing {background} ambient air quality levels impacts. "
152	Air Quality	3-101	No	3	N/A	Section 3.5.6.3.2 provides the reasons for not explicitly modeling mobile source and fugitive dust emissions due to the limitations of the model. However, more information is needed to explain how the use of background ambient air data is used to account for mobile source and fugitive dust emissions from the project. Please clarify this by explaining that the background ambient air data used for the analysis is affected by emissions from mobile equipment and fugitive dust sources. Additionally, it is worth noting that mobile emission sources would be a negligible contribution to air quality impacts and, as such, modeling of these sources is not warranted. Furthermore, fugitive dust impacts and mitigation are adequately covered in this and other sections.
153	Air Quality	3-102	No	2	N/A	Please amend the reference at the end of the second sentence in paragraph 2 on Page 3-102. The reference provided, SECOR 2002, contains no information that can be used to support the premise of this sentence. Publications that could be provided as references are Heinerickson <i>et al</i> , <i>Modeling Fugitive Dust Sources with AERMOD</i> , National Stone, Sand and Gravel Association, January 2007; and Beychok, M.R., <i>Fundamentals of Stack Gas Dispersion</i> , Newport Beach, CA, 2005. "This approach is justified because the background ambient air data used in the assessment of cumulative ambient air quality impacts included this type of emission and the AERMOD model calculates emission dispersion in 1-hour time steps, which would likely over predict the actual ambient air impacts by a wide margin (SECOR-2002Heinerickson <i>et al</i> , 2007; Baychok 2005)."
154	Air Quality	3-102	No	N/A	Table 3.5-12	Please add a footnote to Table 3.5-12 to clarify that the background ambient air concentrations shown in column 5 are based on background values provided in the AQIA in Appendix V of the DEIS. The reason for this request is because the values shown in Table 3.5-12 are not the same as those shown in Table 3.5-8 on Page 3-91.
155	Air Quality	3-103	No	1		Please amend the first sentence in the second paragraph on Page 3-103 as follows for clarity and accuracy. "The modeled maximum <u>highest eighth-high</u> 24-hour average PM _{2.5} concentration was 22.3 µg/m ³ (Table 3.5-12).
156	Air Quality	3-115	No	3	N/A	Please consider adding a brief discussion about the process by which ambient ozone is formed before providing the reasons why ozone formation is likely to be insignificant in the project area.
157	Air Quality	3-116	No	1	N/A	The last sentence in Paragraph 1 on Page 3-116 should be revised for clarity. The discussion before this sentence does not provide the basis for why considerable formation of secondary PM _{2.5} emissions would not be expected. The sentence could be revised as follows to reference a recent modeling study that shows formation of secondary PM _{2.5} is limited by low ammonia concentrations, which is a characteristic of the Alaska North Slope atmosphere. "Therefore, e <u>Considerable formation of secondary PM_{2.5} emissions would not be expected (Baker et al. 2016).</u> " The complete reference is Baker, K.R., R.A. Kotchenruther, and R.C. Hudman, <i>Estimating ozone and secondary PM_{2.5} impacts from hypothetical single source emissions in the central and eastern United States</i> , Atmospheric Pollution Research, 7(1), pp 122 - 133, 2016.
158	Air Quality	3-117	No	3	N/A	Please revise the last sentence in Section 3.5.6.3.7, Oil Spills and Accidental Releases, to clarify the likelihood of a spill occurring. " <u>In the very low chance that a spill were to occur,</u> Emissions from such activity over the life of the Project could be unlikely to possible, minor to moderate depending on the extent of the spill, and short term (Table 3.5-19)."
159	Air Quality	3-118	No	N/A	Table 3.5-20	Please remove Table 3.5-20 for clarity and to avoid any confusion. The presentation of Table 3.5-20 implies there are discernible differences in the impacts for the alternatives relative to air quality. However, this is not in alignment with the last sentence on Page 3-118 which states "neither the different road configurations nor the different CPF locations would result in any discernible difference in effects to air quality." This comment also applies to similar information provided in Chapter 2 (Table 2.4-2, page 102) and the Executive Summary (Table ES 5-1, page ES-48).
160	Air Quality	3-118	No	4	N/A	In the second bulleted sentence on Page 3-118, please clarify the reference for which the comparison is made in the statement, "... which could result in additional fugitive dust and motor vehicle emissions." As written, it is not clear as to which Alternative is being used for the comparison. Alternatively, please state that the greater road length would not have any discernible difference in effects to air quality, as is stated for Alternative 3 in the final sentence on Page 3-118.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
161	Air Quality	3-119	Yes	N/A	N/A	This section takes the position that the AQIA was inherently a cumulative impacts analysis because it consider off-site emissions. This is reasonable, but should be made clear in the original discussion of the methodology used for the air quality impact assessment.
162	Air Quality	3-119	No	3	N/A	For clarity, please define the analysis area of air quality cumulative impacts provided in Section 3.5.6.5. The text and Figure 3.5-2 suggest the area spans from GMT2 to Kuparuk. However, Paragraph 5 on Page 3-120 suggests the evaluation of a larger area.
163	Air Quality	3-121	No	3	N/A	Please edit the second sentence in the third paragraph on Page 3-121 as follows in order to correct a typographical error and to provide references in support of the stated assumption. "Estimates for fugitive Medeling-of-PM emissions were based on an assumption of 75% dust control efficiency (EPA 1988; WRAP 2006)." The referenced documents; <i>Control of Open Fugitive Dust Sources</i> , EPA 450/3-88-008, U.S. EPA, 1988 and <i>Fugitive Dust Handbook</i> , Rev. 6.1, Western Regional Air Partnership's (WRAP), 2006, indicate a 75% dust control efficiency for watering activities that double the moisture content of gravel roads, as compared to the moisture content of uncontrolled gravel roads.
164	Hydrology and Floodplains	3-127	No	1	N/A	In the sentence that states "It includes parts of fourteen 12-digit HUC..." recommend adding "only four would be affected by new infrastructure; the other 10 would be affected by upgrades or additions to or near existing infrastructure."
165	Hydrology and Floodplains	3-127	No	N/A	Table 3.6-1	Recommend more clearly defining the differences in magnitude classifications to delineate between minor, moderate, and major. For example: Major: Hydrologic function/floodplain surface disturbance would be such that successful hydrology and tundra rehabilitation may be possible but would require substantial effort e.g. multiple seasons of intense rehabilitation and monitoring. Moderate: Hydrologic function/floodplain surface disturbance would be such that successful hydrology and tundra rehabilitation could be accomplished through surficial rehabilitation techniques, such as installing additional or correcting existing water conveyance measures. Minor: Hydrologic function/floodplain surface disturbance would be such that successful hydrology and tundra rehabilitation could be accomplished through natural processes.
166	Hydrology and Floodplains	3-127	Yes	N/A	Table 3.6-1	Please revise the duration to remove reference to impacts occurring during project phases (construction, drilling, or operation). In the event that impacts described in Section 3.6.6.3 occur (i.e. overtopped pad or road or washed out culvert due to an outside-of-the-design flood event), most would likely occur in a single break up season and would be immediately repaired. Whether the seasonal event occurs during construction, drilling, or operations is not relevant to the duration of the impact, which would likely be seasonal or would have effects lasting just a few years at most. The focus of the impact criteria on the project phase results in incorrect statement of the duration of potential impacts.
167	Hydrology and Floodplains	3-128	No	N/A	Table 3.6-2	Under gravel pads and roads, please add "considered the effects of cross-drainage culverts, which would be placed as a mitigative measure."
168	Hydrology and Floodplains	3-133	No	2	N/A	Recommend adding that the shape of the hydrograph is also influenced by snow, ice jams and channel ice in the drainage.
169	Hydrology and Floodplains	3-133	No	3	N/A	Recommend discussing the fact that polygons actually trap local melt as small isolated ponds, either attenuating or prohibiting runoff of snowmelt. This is as critical a fact, if not more so, than polygon troughs becoming "channels." Use of "channel" is misleading; "conveyance path" is more accurate because flow through polygon troughs is slow and limited in volume.
170	Hydrology and Floodplains	3-134	No	1	N/A	Please define and briefly characterize the water table in the Project area (e.g., depth, configuration) to serve as background for the climate change discussion in Section 3.6.6.6. In addition, generally define "shallow" versus "deep" groundwater such as in approximate feet below ground surface.
171	Hydrology and Floodplains	3-140	No	1	N/A	Bottom-fast ice does not always provide increased resistance to flow; roughness of ice is often less than that of the bed material. Bottom-fast ice does reduce conveyance area. Recommend rewording the sentence for accuracy.
172	Hydrology and Floodplains	3-149	No	5	N/A	"Because of low summer flow prior to freeze-up and bottom-fast ice, it is possible that ice rafting sufficient to create ice jams occurs on these rivers; however, data are limited." Please provide reasoning as to why low freeze-up flow and bottom-fast ice would result in ice-rafting 'sufficient' to create ice jams.
173	Hydrology and Floodplains	3-152	No	3	N/A	"The maximum scour observed on the Kachemach River was 4.4 feet (MBI 2015a) and on the Miluveach River was 1.5 feet (MBJ 2014)." These scour values are being interpreted incorrectly. Bed elevation is 4.4 feet below the water level but not a 4.4 foot scour depression. It is worded correctly in Table 3.6-3.
174	Hydrology and Floodplains	3-154	No	1	Table 3.6-12	The 2008 'Basis of Recharge Estimate' was also validated with field observations, not just snow-water equivalent data. Revise Table 3.6-12 accordingly.
175	Hydrology and Floodplains	3-156	No	1	N/A	It should be noted that these predicted increases in sea-level rise have been considered in establishing 200-year water surface elevation (WSE) in both 2D model and Stage Frequency analysis.
176	Hydrology and Floodplains	3-156	No	2	N/A	The traditional knowledge quotes in this section lack important context. For each quote, please describe the location being described or clearly indicate in the parentheses that the area being described is not specific to the Project Area. If a location cannot be identified, please delete the quote because description of hydrological conditions in an unnamed area is not relevant to understanding the existing and historical conditions in the Project area or effects of the proposed Project.
177	Hydrology and Floodplains	3-157	Yes	1-3	N/A	For each impact finding, please provide a spatial extent of the expected impact. This information is critical to understanding the context of the impacts described.
178	Hydrology and Floodplains	3-157	No	1	N/A	Bullet 3: Recommend revising likelihood of effects from ice roads and pads on channel stability/alignment to be "unlikely" after taking into account the applicant's proposed mitigation measure, "In accordance with permits, ice road crossings of designated streams and rivers will be slotted, breached, or weakened upon completion of use." This same comment applies to Key Findings, paragraph 1, bullet 3 on pg 3-157; Effects Common to All Action Alternatives, Bullet 3 on pg 3-158; and Table 3.6-15 Summary of Potential Effects on pg 3-173.
179	Hydrology and Floodplains	3-157	No	2	N/A	Bullet 2: Recommend revising likelihood of effects from gravel roads on channel stability/alignment due to culvert washout, road or pad overtopping, or backwater to be "unlikely" when conservative design criteria are taken into account. This same comment applies to Key Findings, paragraph 2, bullet 2 on pg 3-157; Effects Common to All Action Alternatives, paragraph 6 on pg 3-161, paragraph 2 on pg 3-162 and paragraph 3 on pg 3-163; and Table 3.6-15 Summary of Potential Effects on pg 3-173.
180	Hydrology and Floodplains	3-157	No	2	N/A	Bullet 3: Recommend revising likelihood of erosion of tundra due to culvert washout or road overtopping to be "unlikely" when conservative design criteria are taken into account. The same comment applies to Key Findings, paragraph 2, bullet 3 on pg 3-157; Effects Common to All Action Alternatives, paragraph 5 on pg 3-163 and paragraph 4 on pg 3-164; and Table 3.6-15 Summary of Potential Effects on pg 3-173.
181	Hydrology and Floodplains	3-157	No	2	N/A	Bullet 4: Recommend revising likelihood of deposition of sediment on tundra due to culvert washout or road overtopping and channel migration into pads to be "unlikely" when conservative design criteria are taken into account. The same comment applies to Key Findings, paragraph 2, bullet 4 on pg 3-157; Effects Common to All Action Alternatives, paragraphs 5 and 6 on pg 3-164 and paragraph 3 on pg 3-165; and Table 3.6-15 Summary of Potential Effects on pg 3-174.
182	Hydrology and Floodplains	3-157	No	2	N/A	Bullet 6: Recommend revising likelihood of changes to flow direction from insufficient/misplaced culverts to be "unlikely" for stream crossings when conservative design criteria are taken into account. Recommend considering stream crossing culverts and general cross-drainage culverts for sheet flow and flow through polygon troughs as separate design elements with separate effects. The same comment applies to Key Findings, paragraph 2, bullet 6 on pg 3-157; Effects Common to All Action Alternatives, paragraph 3 on pg 3-161; and Table 3.6-15 Summary of Potential Effects on pg 3-173.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
183	Hydrology and Floodplains	3-158	Yes	2	N/A	We strongly disagree with the conclusions of these impact sections. Throughout the EIS process, Armstrong has worked with USACE to provide requested information and incorporate mitigation measures to address USACE concerns. Armstrong's design criteria and mitigation measures are acknowledged in bullet lists in the impact discussion. However, these criteria and measures, in addition to standard BMPs and state permit requirements, have not been fully considered in the determination of potential impacts. For example, the discussion of gravel roads and culverts states that wash out of culverts and overtopping of roads have occurred on the North Slope and thus these occurrences are possible. No information is provided as to whether those past instances were designed using similar criteria, located in areas of similar hydrologic conditions, properly maintained, etc. Rather, the author disregards improvements made in arctic engineering over the last 50 years to come to conclude that major, long term impacts on hydrology are possible. As a result, a worst-case scenario of potential impacts is presented. The impact findings repeatedly justify a major impact finding by stating that rehabilitation "might" be required while providing no analysis of the likelihood of this being the case. This finding overstates the impacts that gravel placement on the North Slope has and will have and is inconsistent with the findings of other recent EIS-documents including the Point Thomson Project and the BLM's GMT1. This same comment applies to Key Findings, paragraphs 1 and 2 on pg 3-157; Effects Common to All Action Alternatives, pg 3-158 through pg 3-171; and Table 3.16-15 Summary of Potential Effects on pg 3-173 and 3-174.
184	Hydrology and Floodplains	3-158	Yes	2	N/A	Recommend revising duration of potential impacts to "short to medium term." Throughout the discussion of potential project effects, "long term" impacts are identified for potential impacts such as washed out culverts, pad erosion, channel migration, etc. In the unlikely event that these events did occur (outside of the design flood event), then the facilities would be immediately repaired to restore access. The effects would likely be seasonal and would certainly not extend more than 5 to 6 years. Per the impact criteria in Table 3.6-1 (pg 3-137) this would meet the definition for short to medium term. This same comment applies to Key Findings, paragraphs 1 and 2 on pg 3-157; Effects Comment to All Action Alternatives, pg 3-158 through pg 3-171; and Table 3.16-15 Summary of Potential Effects on pg 3-173 and 3-174.
185	Hydrology and Floodplains	3-158	Yes	3	N/A	Recommend removing the sentence, "However, the timing of the slotting ("completion of use") may occur after breakup begins, which indicates that the likelihood of an impact on surface waters is possible," and revising the resulting impact findings to acknowledge that ice road completion of use will realistically occur prior to breakup. The ice road season typically lasts from January through late April (p.2-31) and breakup on the nearby rivers begins in middle to late May (p. 3-148). The ADNIR issues land use permits for the ice roads and maintains a North Slope presence (monitoring snow depth and soil temperature) to closely manage the timeframe for when ice roads can be constructed and used ("ice road season").
186	Hydrology and Floodplains	3-158	Yes	3	N/A	The duration of impacts related to ice roads is unsupported. Ice roads are proposed for use only during the construction phase of the project. As a result, any potential impacts would only occur during the construction phase, and less than 5 or 6 years. Recommend revising all long term durations duration to medium term for any ice road related impacts.
187	Hydrology and Floodplains	3-158	No	4	N/A	Bullet 1: Recommend revising likelihood of ice roads and pads causing increased depth and duration of impoundment to be "possible" due to applicant's proposed mitigation measure: "In accordance with permits, ice road crossings of designated streams and rivers will be slotted, breached, or weakened upon completion of use." This same comment applies to Key Findings, paragraph 1, bullet 1 on pg 3-157; Effects Common to All Action Alternatives, paragraph 4, bullet 1 on pg 3-158; and Table 3.6-15 Summary of Potential Effects on pg 3-173.
188	Hydrology and Floodplains	3-158	No	4	N/A	Bullet 2: Recommend revising magnitude of ice roads and pads causing changes in flow direction to be "minor" due to applicant's proposed mitigation measure: "In accordance with permits, ice road crossings of designated streams and rivers will be slotted, breached, or weakened upon completion of use." This same comment applies to Key Findings, paragraph 1, bullet 2 on pg 3-157; Effects Common to All Action Alternatives, paragraph 4, bullet 2 on pg 3-158; and Table 3.6-15 Summary of Potential Effects on pg 3-173.
189	Hydrology and Floodplains	3-159	Yes	3	N/A	The findings of potential impacts related to gravel roads and pads in this section have been based largely on the statement "if gravel roads and pads block or restrict the flow of surface water during spring breakup." Armstrong's design criteria are established to minimize this potential effect. Design criteria and efforts to minimize this effect have not been properly considered in the evaluation of potential impacts.
190	Hydrology and Floodplains	3-160	No	5	N/A	Regarding this statement, "If an increase in the depth and duration of water impoundment at gravel roads or pads is not noticed and corrected quickly, it can result in an increase in thermokarsting. The likelihood of this would be possible." There is no basis supporting how deeper water will exacerbate thermokarsting. Also, by stating impounded water may increase thermokarsting suggests a long duration of impounded water. This contradicts the previous section, where the duration of impoundments was deemed short term. Recommend revising this text accordingly and changing the conclusions of this section and Table 3.6-15 to reflect that the impact is unlikely to occur.
191	Hydrology and Floodplains	3-162	No	1	N/A	Regarding this statement: "...because the impact would likely last more than a season and possibly more than 4 years." The basis for "4 years" seems arbitrary. Please explain the basis for this time period here and in other locations within this section where it is used (i.e. paragraph 5 on pg 3-163, paragraph 5 on pg 3-164, paragraphs 1 and 2 on pg 3-165).
192	Hydrology and Floodplains	3-163	No	4	N/A	Based on the methods presented, recommend revising the likelihood of gravel roads being overtopped to be "unlikely." As currently written, the likelihood finding of "possible" is unsupported. This general statement does not take into consideration the Applicant's engineering and design of its Project features, which would make overtopping of a gravel road or pad unlikely. The analysis of likelihood should be based on the Project as proposed, not on the occurrence of pad overtopping at unrelated North Slope facilities that may or may not have been designed to the same project standards. If past overtopping events occurred on older roads or pads not built to today's more conservative and data-informed design criteria, then it should have no bearing on the probability of overtopping occurring to these new facilities. The basis of design indicates that the gravel roads in the floodplains will be designed to be at least 1 foot higher than the 200-year WSE for open or ice conditions (or highest observed WSE whichever is highest) plus calculations made to account for the height of waves. The same comment applies to page 164, paragraph 5.
193	Hydrology and Floodplains	3-163	No	6	N/A	Please provide discussion and justification pertinent to the identified impact. This section states in first sentence that gravel pads can result in erosion of tundra or stream channels, yet subsequent discussion is limited to failure of designed erosion protection. Failure of designed erosion protection would result in pad erosion, not tundra/stream erosion.
194	Hydrology and Floodplains	3-171	No	1	N/A	Please provide a definition of "stream channels" crossed by Mine Area D. No features with defined OHW or bed and banks are visible in the footprint of Mine Area D.
195	Hydrology and Floodplains	3-172	Yes	4	N/A	The text states: "The greatest impacts would likely result from placement of gravel pads and gravel roads in floodplains and river crossings, since changes to natural drainage patterns and alterations in water flow could occur. Minor and moderate impacts would result from other Project activities." However, this is not what is described in Section 3.6.6.3 or in Table 3.6-15. Please revise the impact findings in Section 3.6.6.3 and Table 3.6-15 to provide accurate analysis of the context and intensity of potential impacts related to this project.
196	Hydrology and Floodplains	3-175	No	N/A	Table 3.6-16	Please delete or clarify need for and source of information in "Gravel road culverts at streams and primary conveyance paths" under Alternatives 2 and 4, which highlights crossing of fish bearing tributary to the Miluveach River. This information is not conveyed in Section 3.12 Fish and EFH. If text remains, please indicate whether fish-bearing status of other streams and primary conveyance paths is negative (as currently implied) or unknown.
197	Hydrology and Floodplains	3-175	No	N/A	Table 3.6-16	Recommend removing numbers of gravel road cross-drainage culverts from this table and the text that follows. These structures are installed as a mitigative measure so using a larger number as less desirable is counterintuitive. Miles of gravel roads is the proper metric and adequate for comparing the impacts described.
198	Hydrology and Floodplains	3-180	No	N/A	Figure 3.6-7	Please revise this figure to include existing infrastructure. As displayed, existing roads, pads, and other facilities are not shown, and this does not provide spatial context for the exploration and development projects under consideration as part of the cumulative effects analysis.
199	Hydrology and Floodplains	3-182	No	3	N/A	Recommend deleting the following statement: "If peak events are lower, then the Project may be built to an overly conservative design." This would not be an impact to the Project.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
200	Hydrology and Floodplains	3-183	No	4	N/A	Please revise the "Applicant's Mitigative Measures" to more clearly reflect the Applicant's Proposed Mitigation Statements provided in the July 2017 DA Permit Application Package. These include: p. 3-183, bullet 1 - add that the location of drill sites avoids placement of surface facilities west of the East Channel of the Colville River and avoids associated transportation and pipeline infrastructure to access this area. p. 3-183, bullet 4 - revise to "stockpiling of gravel within WOUS is not proposed as part of the Project. Therefore, additional acreage is not being requested. Gravel would be transported directly from the material site and placed on the permitted project footprint." p. 3-184, bullet 3, revise "fish-bearing drainages" to "fish-bearing streams." p. 3-184, bullet 6 and 8, add "to the extent practicable" after statement.
201	Hydrology and Floodplains	3-184	No	1	N/A	Recommend adding: Drill sites are oriented with the long axis parallel to the prevailing northeast/southwest wind direction to minimize snow drift and related maintenance activities. Drill site orientation could minimize potential effects on hydrology during spring breakup.
202	Hydrology and Floodplains Technical Information	VI.1-2	No	4	N/A	Recommend rewording bullet to specify that snow-packed conditions have not currently been modeled so an assessment of the approach (snow thickness, extents, roughness, etc.) could not be evaluated. The 2015 peak WSEs were the result of snow-packed channel and bottom-fast ice. The bottom-fast ice model condition does not take snow pack into consideration. Presence of snow-pack can significantly reduce conveyance area, particularly on the Kachemach River, well beyond just bottom-fast ice. These are not similar conditions and it is thus not a surprise that the respective WSEs differ; not comparing these conditions is not an oversight. The described conditions (MBI 2015 breakup report and Sections 7.1.2 and 7.1.3 of this chapter) clearly identify ice and snow as being the cause of high stage in 2015. As described in the Design Basis, and in a preceding bullet of this section, future modeling will consider snow-pack.
203	Hydrology and Floodplains Technical Information	VI.1-20	No	8	N/A	Justification of the 1-foot of freeboard has been provided by the Applicant. Additionally, the Applicant has stated that the freeboard may be adjusted to account for additional uncertainties or to account for wind waves. This paragraph is incorrect.
204	Hydrology and Floodplains Technical Information	VI.1-28	Yes	2	N/A	The 1D models developed for this project were preliminary and pre-date most of the field work and Colville River modeling. Additionally bridge locations and geometry had not been finalized. We agree the previous models are not accurate. They are not the models being used in design.
205	Hydrology and Floodplains Technical Information	VI.1-29	No	9	N/A	As indicated in the previous comment regarding page VI.1-2, these were not similar conditions based on what was described for 2015 breakup conditions. Rephrase to more accurately identify the need to model snow-packed conditions.
206	Water Quality	3-187	Yes	1	N/A	Recommend adding a discussion to this chapter that naturally occurring sheen caused by bacteria is a common occurrence on the North Slope and can be mistaken for spilled hydrocarbon. https://www.michigan.gov/documents/deq/deq-oea-nop-bacteria_378414_7.pdf
207	Water Quality	3-189	No	4	NA	In the first sentence and second sentences, recommend changing "Proposed" to "Evaluated." The discharges described are not proposed by Armstrong (i.e., gravel pit dewatering effluent) but are being evaluated in this document.
208	Water Quality	3-190	No	2	NA	Recommend deleting bullet 3 or moving discussion to Section 3.3 Geology and Minerals as Class I UIC well disposal would not have impacts on surface water quality other than avoiding need for surface discharge. This comment also applies to page 3-191, paragraph 1.
209	Water Quality	3-192	No	1	N/A	Please revise the third bullet to clarify that gravel mining is not part of the Project, for example, "Waters downgradient of the Project's ice elements and the potential Mine Area D, which, if completed, would be a connected action. These waters include the Miluveach..."
210	Water Quality	3-192	No	3	NA	Bullet 2: Please revise reference to wetland setback criteria as "based on high value wetlands protection easement criteria" as described in the Northwest Area Plan (http://dnr.alaska.gov/mlw/planning/areaplans/northwest/pdf/nwap_2008_complete.pdf). Recommend acknowledging in a footnote that this plan is not applicable to the Project area but that the protection easement is being used as a general guideline. Recommend also revising or clarifying statement that upgradient sides of the road may receive runoff from Project Activities.
211	Water Quality	3-194	No	N/A	Figure 3.7-1	The analysis area as shown in this figure includes the ASRC and NSB mine sites. The ASRC and NSB mine sites will be evaluated under a separate and independent permitting effort. Recommend revising the figure to omit reference to the third-party mine sites. However, we recommend including both mine sites in the cumulative impact analysis area.
212	Water Quality	3-194	No	N/A	Figure 3.7-1	Recommend revising the analysis area in Figure 3.7-1 and Figure 3.7-2 to exclude lands or waters west of the Colville River and East Channel. These figures show lands on the west side of the Colville River and portions of the Kupigruak Channel as part of the analysis area, but the described analysis area on page 3-192 does not mention these.
213	Water Quality	3-194	No	N/A	Figure 3.7-1	The analysis area east of Oilktok Road extends upgradient substantially further than 80 feet from the toe of the Oilktok Dock Road. Please revise for consistency with analysis area description on page 3-192.
214	Water Quality	3-195	No	N/A	Table 3.7-2	Please add a footnote to "Gravel mine development and operations" to clarify that this refers to Mine Area D, which, if it is developed, would be a connected action.
215	Water Quality	3-202	No	2	N/A	Please confirm accuracy of value and/or units in the statement "Concentrations exceeding 500 µS/cm are indicative of brackish or saline environments." Comparing this value to the reported values from the Colville and analysis area lakes suggests that they are brackish or saline. Other sources suggest that ocean water is in the range of 50,000 µS/cm. If the values reported are correct, please provide a reference and recommend addressing if and why specific conductance in lakes and the Colville River as far upstream as Umiat are brackish or saline.
216	Water Quality	3-204	No	5	N/A	Focus of paragraph is on permafrost thaw causing some lakes to drain. Suggest adding that permafrost thaw also causes subsidence which can alternatively increase the size and therefore volume potential of lakes.
217	Water Quality	3-206	No	1	N/A	Recommend clarifying the statement of risk from a spill outside of gravel infrastructure as follows: "The impact of a spill outside of gravel infrastructure would be unlikely, and, depending on the size, location, and circumstances of the spill, could be up to major and medium to long term."
218	Water Quality	3-208	No	1	NA	Please revise the statement that "monitoring for oxygen and pH is not typically required" for consistency with the statement on page 3-189 that says water quality monitoring of permitted lakes is sometimes a permit stipulation.
219	Water Quality	3-209	No	2	N/A	Please explain what specific effects cross-drainage culverts would have on water quality. If the effects would be negligible, consider removing them from Table 3.7-8.
220	Water Quality	3-215	No	4	NA	Please revise to clarify that discharges of contaminated material from secondary containment structures is not part of the proposed Project. Such discharges would be a violation of the APDES North Slope General Permit.
221	Water Quality	3-221	No	N/A	Table 3.7-10	The magnitude of "handling, transport, and storage of hazardous materials" (minor to major) is inconsistent with Section 3.7.6.3.6, which indicated a magnitude of minor to moderate. Also recommend adding to the end of the "a" footnote "should a spill occur."
222	Water Quality	3-222	No	N/A	Table 3.7-10	Recommend revising footnote b to indicate the likelihood of spills of various size occurring. This information is available in Table 3.7-9 but the likelihood of the spill occurring has not been carried forward into this summary table.
223	Water Quality	3-222	No	N/A	Table 3.7-10	Please add a footnote that discharges of domestic wastewater and effluent from mobile spill response units to surface water are not part of the proposed Project.
224	Water Quality	3-222	No	N/A	Table 3.7-10	For spills of produced fluids, please also include a reference to footnote "b", as modified. Without this information, the likelihood of impacts is misleading.
225	Water Quality	3-223	NO	2	NA	The effects of cross-drainage culverts on water quality is not specifically described. Recommend clarifying whether more cross-drainage culverts are perceived as a positive project feature or negative one. More cross drainage culverts could further minimize ponding of water and potential thermokarst effects. However, as the number of cross drainage culverts is currently based solely on the length of gravel road (1 culvert per approximately 500 feet), the difference in culvert numbers is based solely on the length of road in each alternative.
226	Water Quality	3-226	No	3	N/A	Please add Applicant mitigative measure: "Design all pipelines aboveground and locate all Miluveach and Kachemach river crossings in the vicinity of proposed roads and bridges to provide better access for leak detection, maintenance, and potential spill response to minimize spill risk."

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
227	Water Quality	3-226	No	1	N/A	Please revise the "Applicant's Mitigative Measures" to more clearly reflect the Applicant's Proposed Mitigation Statements provided in the July 2017 DA Permit Application Package. These include: p. 3-226, bullet 2 - revise whole statement regarding pipeline leak prevention to match current Applicant's Proposed Statements. p. 3-226, bullet 3 - delete since Pipeline-river crossings are addressed in statement in comment above. P. 3-227, bullet 1 - revise to remove reference to CPAI seawater treatment plant and change to third-party. p. 3-277, bullet 2 - revise statement on UIC wells to reflect Applicant's Proposed Mitigation Statements. There will be up to four total UIC wells, with one at each drill site and one at the operations center. p. 3-227, bullet 3 - revise to "Discharge of domestic wastewater to the tundra at the project site is not planned during normal conditions." p. 3-227, bullets 7 and 8 - revise measures related to culverts to more closely reflect Applicant's Proposed Mitigation Statements.
228	Water Quality	3-227	No	9	N/A	Recommend adding: Existing barge infrastructure at Oliktok Point will be used to avoid the need to construct new marine facilities to support sealift module delivery.
229	Water Quality	3-227	No	9	N/A	Recommend adding: Gravel roads provide all-season access to parallel export/import and infield pipelines for visual inspection and routine and emergency maintenance and repairs. This also reduces the need for tundra travel associated with these activities. Roads and pipelines will be located within 1,000 feet of each other where feasible.
230	Water Quality	3-227	No	9	N/A	Recommend adding: Pads and roads will be designed to limit point sources of runoff to the surrounding tundra. Instead, both snowmelt and rain water on the pad will primarily seep directly through the gravel.
231	Water Quality	3-227	No	9	N/A	Recommend adding: Regular ice road use will be limited to construction activities to minimize the need for annual withdrawal of water for ice road construction. Ice roads are not planned for use on a regular basis to support drilling and operations.
232	Water Quality	3-227	Yes	9	N/A	Please review the Applicant's Proposed Mitigation Statements for additional spill prevention and response measures that could minimize potential water quality impacts: - pipeline insulation system and in-line inspection - encased pipelines at road crossings - pipelines above ground and river crossings are in vicinity of roads to facilitate inspection, detection, maintenance, potential spill response - gravel road connection provides year-round access for emergencies and spill response - ODPCP, SPCC, primary and secondary containment - Licensed transporters - Personnel training - Spill response equipment staged throughout field - ACS membership
233	Wetlands and Vegetation	3-230	No	2	N/A	Recommend providing a brief summary of methods used to develop the Applicant-provided mapping to explain difference from desktop-based mapping described later in paragraph. For example, "Approximately 71,106 acres were mapped and delineated for wetlands and waterbodies between 2013 and 2016 using data collected at 338 field points, high resolution aerial imagery, elevation data, and vegetation mapping (see Armstrong 2017c in Appendix VII)."
234	Wetlands and Vegetation	3-231	Yes	3	N/A	Please justify addition of 106,875 acres of NWI mapping to form an "east analysis area" to evaluate a "relatively small amount of fill (3 to 7% of the total fill)" as stated here. Armstrong has collected and processed a substantial amount of data to produce over 70,000 acres of jurisdictional level mapping and functional assessment provided in the "west analysis area." The inclusion of an additional 106,000 acres of NWI mapping is confusing and creates a false equivalency between evaluation of wetland functions in the NWI-mapped area. Quantitative analysis is not required for NEPA and in this instance is likely not more accurate or informative than qualitative discussion. Evaluation of effects to areas along existing roads could be more appropriately addressed using a qualitative evaluation with acknowledgement of uncertainties that remain due to the lack of detailed data. At minimum, we recommend substantially reducing the East AA to focus on wetland areas within immediate proximity to the roads considered for upgrade.
235	Wetlands and Vegetation	3-234	No	1	N/A	Bullet 2 - The Wetlands Methods Memorandum (DOWL 2016) found in Appendix VII does not describe required assumptions and generalizations made to translate NWI classification to wetland and waterbody types. Recommend that additional explanation be added on page 3-234 or in Appendix VII to address limitations of the NWI data including mapping scale, the number of wetland types mapped, lack of jurisdictional determination, etc. This would help explain the large differences visible between the mapping of the East and West AAs visible in Figures 3.8-9 and 3.8-10.
236	Wetlands and Vegetation	3-235	No	2	N/A	Bullet 1 - In the first sentence, recommend changing "would" to "could" as impacts described for ice roads and off-road travel range from unlikely to probable. Recommend avoiding mixing discussion of ice road travel and winter off-road travel as these activities are different and may have differing impacts. In bullet 2, recommend changing verb from "would" to "could" as impacts described later in the section range from possible to probable.
237	Wetlands and Vegetation	3-235	Yes	2	N/A	Bullet 2 and throughout the section - Please revise discussion of potential impacts related to invasive species to reflect the fact that the lack of invasive species pathways into the project area is not the limiting factor governing their presence or absence as evidenced by the fact that the nearest species occurrence is over 80 miles away despite industrial roads in the East AA. Rather, climate is the driving factor in invasive species distribution. Throughout this section, this distinction should be emphasized and the impact should be revised to describe the potential for the project to increase pathways for invasive species introduction and dispersion, but not necessarily increase species occurrence. Discussion of increases in invasive species occurrence is most appropriate in discussion in cumulative effects-climate change.
238	Wetlands and Vegetation	3-235	Yes	3	N/A	In the third sentence, please delete "for wetland effects." Here and elsewhere, the section repeatedly uses the term "wetlands" to refer to effects in areas that have been classified as wetlands, uplands, and waterbodies. This is inaccurate based on definitions found in 33 CFR 328.3 (b).
239	Wetlands and Vegetation	3-236	Yes	N/A	Table 3.8-3	At minimum, recommend providing additional text to explain why the magnitude criteria are not applicable to evaluation of five of the eight types of potential impacts considered. Recommend either revising the impact criteria to include both qualitative and quantitative magnitude criteria to allow for evaluation of these types of impacts to clearly communicate potential magnitude.
240	Wetlands and Vegetation	3-236	Yes	1	N/A	Bullet 2 - The Wetlands Methods Memorandum (DOWL 2016b) found in Appendix VII does not describe the methodology used to evaluate wetland function in the East AA in enough detail to allow review. NWI data is only one piece of information used by Armstrong in developing its Aquatic Site Assessment. Additional mapping attributes used in Armstrong's ASA included terrain units, surface form, modifiers for waterbody classes, and fish presence, as well as three additional data layers delineating floodplains, large depressions, and waterbodies with a long fetch. It is unclear from DOWL 2016b whether these same attributes and additional data layers were developed for the East AA and, if developed, how they were used to identify performance of wetland function. As a result, we cannot evaluate the technical accuracy of the method or evaluate if and how performance of function in the two areas is comparable. Recommend that the text on page 3-236 or in Appendix VII be revised to describe the full methods used to develop functional assessment data for the East AA.
241	Wetlands and Vegetation	3-237	No	1	N/A	Bullet 1 (continued from previous page) - Statement that soil thermal regime can not be assessed without data from excavated soil pits is incorrect. As described on page 18 of Armstrong's ASA (Armstrong 2017d), the selection criteria for areas that perform the maintenance of soil thermal regime function are based on Terrain Units, not on specific characteristics of excavated soil pits. Please revise or delete this statement.
242	Wetlands and Vegetation	3-237	No	1	N/A	Bullet 1 (continued from previous page) - The statement that open waterbodies generally lack shoreline and bank stabilization is at odds with the identification of all large waterbodies performing the shoreline and bank stabilization function in the East AA in Figure 3.8-14. Please clarify this statement.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
243	Wetlands and Vegetation	3-237	No	3	N/A	Recommend revising the last two sentences for clarity as the last sentence ("Uplands also include...") suggests that the upland categories described are distinct from the "approximately half natural upland habitat and half previously filled wetlands" described in the previous sentence.
244	Wetlands and Vegetation	3-241	No	1	N/A	Please explain or resolve inconsistencies in description of the avian habitat value of old and young basin complexes with discussion of habitat value in Section 3.9 Birds. Page 3-241 states that "Wetland classes with high interspersed, or intermixing of different wetland types (Figure 3.8-8), provide high quality habitats and on the North Slope; and wetland habitat interspersed is a reliable predictor of avian density (Martin 1983; Spindler 1978). Drained lake basins (such as Old and Young Basin Complexes, which are described below) are examples of wetlands with high interspersed." However, based on the statistical analysis described in Table 3.9-4 (page 3-310), Old and Young Basin Wetland Complexes are not high-value habitat.
245	Wetlands and Vegetation	3-247	Yes	2	N/A	For Figures 3.8-11 through 3.8-26, please provide additional discussion or reasoning for clear differences in types of areas and overall acreage of the East and West AAs performing each function. It is unclear from the discussion provided in this section and in Appendix VII whether these differences reflect meaningful differences in wetland types and characteristics between the two AAs or are merely an artifact of differences in data scale and availability. The text describes limitations regarding the soil maintenance and thermal regime function but does not describe other potential limitations resulting in inconsistency in findings. These include identification that half of a lake performs the Shoreline and Bank Stabilization function whereas the other half does not. The discrepancies between the two methodologies suggest that inclusion of the NWI-based ASA in the East AA does not add meaningfully to the evaluation of impacts in this section. Specific issues by function are described below.
246	Wetlands and Vegetation	3-249	No	N/A	Figure 3.8-11 and Figure 3.8-12	Please provide reasoning for the conclusion that a much larger portion of the West AA performs the flood flow modification and conveyance function than in East AA. Please explain if this is a result of actual differences in functions likely performed between the two areas or whether it is a result of differences in data available and/or methodology used to evaluate each area (i.e., availability of Floodplains and Large Depressions layers).
247	Wetlands and Vegetation	3-251	No	N/A	Figure 3.8-13 and Figure 3.8-14	Please provide reasoning for conclusion that the shoreline and bank stabilization function is performed along lake, river and shoreline margins in the West AA whereas in the East AA, it is performed primarily within large lakes. The large lake north of the Alternative 4 CPF is split between the two AAs with half identified as performing the function (in the East AA) and half as not (in the West AA). Please explain if this is a result of actual differences in area the function is likely performed or whether it is a result of differences in data available and/or methodology used to evaluate each area (i.e., availability of Long Fetch and Floodplains layers). The identification of ponds and lakes as performing this function in the East AA is at odds with the methodology described in Armstrong 2017 where vegetation is an indicator for performance of this function.
248	Wetlands and Vegetation	3-253	No	N/A	Figure 3.8-15 and 3.8-16	Please provide reasoning for the differences in identification of Production and Export of Organic Matter Function in the East and West AAs. For example, please clarify whether streams and areas within floodplains were evaluated for performing this function in the East AA as they were for the West AA.
249	Wetlands and Vegetation	3-257	No	N/A	Figures 3.8-19 and 3.8-20	Please provide reasoning for the large differences in area identified as performing Waterbird Habitat between the East and West AAs. Please state whether identification of waterbird habitat in the East AA included consideration of the same factors as used in the West AA, specifically identification of deep lakes and ponds, areas with island or highly polygonized margin surface form, and areas of low-centered polygons or disjunct polygons.
250	Wetlands and Vegetation	3-259	No	N/A	Figures 3.8-21 and 3.8-22	Please provide reasoning for the large differences in areas identified as performing Terrestrial Mammal Habitat between the East and West AAs. For example, please explain whether the much larger proportion of the East AA identified as performing the terrestrial mammal habitat in the East AA when compared to the West AA is the result of the mapping on which the ASA's were based (NWI vs. jurisdictional determination-level) and the much larger areas identified as moist sedge-shrub tundra identified in the NWI-based dataset.
251	Wetlands and Vegetation	3-262	No	N/A	Fig. 3.8-24	Please clarify whether streams in the East AA were evaluated for performance of fish habitat. For example, Kalubik Creek is identified as an AWC stream in Figure 3.12-2 but is not identified as providing fish habitat in Figure 3.8-24. Please clarify methods used to identify lakes and ponds in the East AA as providing fish habitat for sensitive fish species. Many of the lakes and ponds identified in Figure 3.8-24 are likely too small and shallow to support fish species other than Alaska Blackfish or Ninespine Stickleback and/or do not appear to have direct surface water connections to fish-bearing waterbodies. Please refer to publically available lake studies in the Kuparuk River Unit (available from ADNR and/or ARLIS) for additional information on lake depth and characteristics in the East AA.
252	Wetlands and Vegetation	3-265	No	1	N/A	The statement, "Because of minimal human development, mechanisms for invasive species introduction or transport are not present," is misleading as roads and existing industrial and local traffic occur in the AA and could serve as a pathway for transport. Recommend revising discussion to acknowledge that the limiting factor governing invasive species distribution in the area is climate, not pathways for transport.
253	Wetlands and Vegetation	3-265	No	1	N/A	Recommend stating that Coldfoot is more than 200 miles south of the Project Area to provide spatial reference.
254	Wetlands and Vegetation	3-266	No	1	N/A	Recommend revising the sentence "wetland function is generally decreasing" as it oversimplifies a complex process. For example, changes in vegetation community or drying could increase some functions (Terrestrial Mammal Habitat).
255	Wetlands and Vegetation	3-266	Yes	4	N/A	Please provide context (location and relevance to the proposed project) of each of the quotes provided in this section.
256	Wetlands and Vegetation	3-268	No	4	N/A	Recommend using "long term" in place of "permanent" for consistency with impact criteria and replacing "during the life of the Project" with "beyond the life of the Project."
257	Wetlands and Vegetation	3-269	No	2	N/A	Please discuss off-road travel separately from ice road impacts, as they are different activities.
258	Wetlands and Vegetation	3-270	No	3	N/A	Recommend revising this sentence to differentiate between ice road and off-road travel. For example: "Multiple studies have indicated that the degree of site wetness is a key factor in mitigating effects from ice infrastructure; ice roads that cross wetter vegetation result in fewer effects than ice roads that cross drier vegetation." This comment also applies to similar text on page 3-328.
259	Wetlands and Vegetation	3-271	No	3	N/A	Recommend revising the statement that the magnitude cannot be described as this is not informative to the reader. Recommend describing the impact qualitatively with consideration of the abundance of wetlands and the small amount of areas likely to be impacted. This comment also applies to findings on page 3-272.
260	Wetlands and Vegetation	3-271	No	5	N/A	Recommend revising sentence for accuracy: "Off-road travel in winter on drier tundra is more likely to damage vegetation ..."
261	Wetlands and Vegetation	3-271	No	6	N/A	Recommend revising this discussion to avoid implication that off-road travel always results in tundra damage. For example, rolligons are only one type of off-road travel used and impacts from other forms of travel would be even less likely. In addition, recommend revising findings to avoid counterintuitive finding that damage from winter tundra travel is more likely than from summer tundra travel. While winter off-road travel may occur more frequently, particularly during construction, the likelihood of tundra damage is low for both summer and winter travel due to compliance with existing regulations and BMPs.
262	Wetlands and Vegetation	3-272	No	5	N/A	Recommend revising the statement that the magnitude cannot be described as this is not informative. Recommend describing the magnitude of the impact qualitatively based on information available. For example, Alternative 2 would directly impact 0.5% of areas within the West AA performing the Terrestrial Mammal Habitat Function (210.9 acres out of a total of 35,981 acres). The affected percentage would be even less when considering the affected watersheds as a whole as Terrestrial Mammal Habitat is a function that is performed widely with the Kachemach, Miluveach, Colville Delta Watersheds. As a result, it is possible to state that impacts to this function would be minor. This conclusion is also true for all other functions discussed.
263	Wetlands and Vegetation	3-273	Yes	N/A	Table 3.8-8, 3.8-15, 3.8-16	In these three tables, recommend avoid use of the symbol "NA" when a value has been evaluated and is zero. For example, in Table 3.8-8, the acreage of scarce and valued habitat affected by the four alternatives has been evaluated and found to be zero. This is a different finding than "not applicable" which suggests that it was not evaluated.
264	Wetlands and Vegetation	3-274	No	N/A	Table 3.8-9	Please clarify the statistic being used to measure "Total wetland habitat types (Total NWI types)." As written, we interpret it as a count of the number of transitions between NWI types within the direct fill footprint. Based on this understanding, a decimal point (i.e., a portion of a transition) would not be appropriate. Furthermore, please clarify that the number of NWI types does not refer to unique types but rather a change from one type to another with the same NWI types represented multiple times.
265	Wetlands and Vegetation	3-276	No	2	N/A	Recommend revising duration of dust impacts to "medium term." Dust is created during operations primarily as a result of use of gravel infrastructure by vehicles. This effect will cease with completion of the project and "restoration" of related effects will likely occur naturally, as the tundra surface and vegetation mat will remain intact.
266	Wetlands and Vegetation	3-276	No	N/A	Table 3.8-10	In the header row, please revise the header "Wetland loss in watershed (acres)" to reflect that 1) indirect impacts would not result in wetland loss but rather may result in wetland alteration and 2) the acreages provided describe both wetlands and waterbodies, not just wetlands.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
267	Wetlands and Vegetation	3-278	No	2	N/A	Recommend revising the likelihood of introduction of invasive species. As stated in the affected environment, invasive species have been documented no closer than 80 miles from the Project Area with climate likely being the limiting factor to their introduction in areas where roads currently exist. Thus, invasive species establishment as a result of the Project is unlikely. When considered in combination with climate change, a cumulative impact may be possible. This comment also applies to Page 274, paragraph 2.
268	Wetlands and Vegetation	3-285	Yes	1	N/A	In summary bullets for Alternatives 2 through 5, recommend revising statement "The smallest loss of wetland diversity..." to "The smallest loss of wetland diversity per acre ..." to reflect the metric actually being compared.
269	Wetlands and Vegetation	3-287	No	N/A	Figure 3.8-30	Please correct symbology for existing and proposed development and exploration projects. Most of the projects listed as present exploration projects are existing developments (e.g. Alpine, Meltwater, Tarn).
270	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: DS3 has been relocated to a suitable location outside of the Colville River floodplain, thus minimizing placement of gravel within the floodplain.
271	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: Drilling for VSMs will occur from an ice road and drilling cuttings will be sidecast onto the ice around each VSM, avoiding a discharge of fill material into WOUS, since the sidecasting will not change the bottom elevation of a WOUS or replace any portion of a WOUS with dry ground. The drilling cuttings will be removed once VSM installation is complete.
272	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: The export/import pipeline will be co-located with an existing pipeline and gravel road associated with the Kuparuk River Unit between DS2M and the Kuparuk CPF2. Where available, co-location with existing pipelines and roads minimizes impacts to the aquatic environment compared to having the two features spaced farther apart.
273	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: Project roads are located to reduce impacts to hydrology through minimization of the placement of gravel fill within the floodplain. In addition, the placement of the Miluveach and Kachemach River bridges at narrow portions of the rivers minimizes placement of gravel fill in the floodplain and piers below ordinary high water.
274	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: Pads and roads will be designed to limit point sources of runoff to the surrounding tundra. Instead, both snowmelt and rain water on the pad will primarily seep directly through the gravel.
275	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: All pads are sized to minimize overall gravel requirements while maintaining space for a sufficient number of well heads to meet the overall project purpose. Well head spacing has been reduced from 30-feet to 20-feet to further minimize drill site footprint.
276	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: External corrosion inspections of pipelines will be conducted during winter and will be supported by approved tundra travel vehicles to avoid impacts associated with summer tundra travel.
277	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: Discharge of domestic wastewater to the tundra at the project site is not planned during normal conditions.
278	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: Personnel will be required to stay on gravel or ice surfaces to minimize impacts to the tundra unless their specific job duties require them to be on the tundra, and that activity is properly permitted.
279	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: Except for removal of snow and ice in excess of 4 inches from work areas, disturbance of the tundra, including vegetation and organic cover, will be avoided during gravel placement to minimize impacts to permafrost.
280	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: Snow removal management measures will be implemented to reduce the potential for gravel fill to be pushed off pad during snow removal.
281	Wetlands and Vegetation	3-291	No	1	N/A	Please add the following mitigative measure: At the conclusion of production, abandonment of project facilities will be conducted in accordance with ADNR Division of Oil and Gas North Slope Areawide Lease Mitigation Measures and in compliance with all permit and lease requirements.
282	Birds	3-293	Yes	1	N/A	Recommend citing sources of empirical data wherever statements of fact or values are provided. Previous NEPA documents are not studies and should not be cited as support for biological or ecological facts. For example, BLM 2004a, an EIS for Alpine, was not a scientific study that identified 80 bird species near the CRD and nearshore waters.
283	Birds	3-293	Yes	1	N/A	The extent, or geographical area of the impact, should be discussed for each effect category. Currently, a discussion of extent is inconsistent throughout Section 3.9. The discussion of extent should use well defined, consistent terms. Extent should be discussed wherever the impact criteria are discussed and impact conclusions are drawn, as is denoted by subsequent comments. Specifically, extent is not discussed on page 3-325, paragraph 6, page 3-333, paragraph 1, page 3-339, paragraph 1, or 3-340, paragraph 2.
284	Birds	3-293	no	1	N/A	In the ACP, there is no 'vegetation clearing' as per USFWS guidelines, please remove discussion of vegetation clearing windows.
285	Birds	3-294	No	3	N/A	Recommend changing 'would' to 'may' in second sentence. Also, recommend deleting the phrase "and must authorize actions that may affect these species" from last sentence. There is no specific authorization required for the MBTA and USFWS is not required to authorize actions that may affect ESA-listed species.
286	Birds	3-296	no	N/A	Fig 3.9-1	In the introduction to this section, the authors cited references for number of bird species in the CRD yet the analysis area for bird presence does not cover the majority of acreage surveyed in the Alpine area since the 1990s. This should be clarified.
287	Birds	3-298	No	N/A	Table 3.9-2	In row 3, column 2, recommend deleting bullet 3 as this information is covered in row 5. In row 5, column 1, please add footnote to Spills and Containment to indicate that these are also not a project activity but are assessed for effects.
288	Birds	3-298	Yes	N/A	Table 3.9-2	In row 1, column 1 includes activities conducted during winter and summer - these seasonal activities would have different effects on birds yet are lumped together. Winter activities should be separated from summer as the effects to birds would be quite different, given that the majority of avian species would not be present in the Project area during winter construction activities.
289	Birds	3-299	No	5	N/A	In first sentence, recommend revising "would" to "could" as the bird density estimates are used to approximate the number of birds that could be affected but does not indicate certainty of those effects occurring.
290	Birds	3-299	No	6	N/A	Please indicate the source of habitat mapping described in this paragraph and shown in Figure 3.9-2. The added text describes the methods used to develop the mapping (i.e., classification system) but it is unclear if the mapping itself is 1) the same as used in the Wetlands and Vegetation discussion, 2) was developed by the USACE and its contractors for this DEIS, or 3) if it is from some other source.
291	Birds	3-301	No	3	N/A	Recommend providing additional context regarding use of the project area by Steller's eiders. The text states that their current breeding range is centered on Barrow, but it would be helpful to state that they are not known to breed in the Project Area and are only casual or accidental visitors.
292	Birds	3-318	No	N/A	Figure 3.9-3	Please show the survey area extent for each species presented in Figures 3.9-3 and 3.9-5 through 3.9-8 so that it is clear how much of the analysis area is covered by the various surveys. Without providing the context of the survey areas, it appears that the resource presented in the figure (spectacles eider nesting, brant colonies, etc.) only occurs in a portion of the analysis area, when in fact portions of the analysis area may not be covered by the survey area. Additionally, the analysis area shown on Figures 3.9-5 through 3.9-8 does not match the analysis area defined in Figure 3.9-1. Please correct inconsistency. For Figure 3.9-3 and Figures 3.9-5 thru 3.9-8, please clarify if the unshaded/white areas mean: no data, 0 density, or outside of the survey area.
293	Birds	3-320	No	2 & 3	N/A	Recommend providing additional context regarding the bird densities shown in Figure 3.9-3 through 3.9-8 to help explain the density values provided. For example, are densities for each species high, medium, or low in the analysis area relative to other parts of their range or the ACP? Recommend also stating that the species for which bird density figures are provided are the focal species defined on page 3-299.
294	Birds	3-325	no	5	N/A	Recommend that the analysis take into account existing operations in Kuparuk and CRD and the fact that Tundra Swan numbers haven't decreased at a population level, despite continued development. Reference ABR annual reports
295	Birds	3-325	Yes	5	N/A	Recommend revising the Environmental Consequences section of Section 3.9 to discuss effects to T&E bird species separately as they were in the affected environment.
296	Birds	3-326	No	2	N/A	Bullet 2 - The East Channel of the Colville River has not been previously described as a bird migration corridor. Please add this information along with appropriate citations to the affected environment section to provide context for this impact finding. This same comment applies to bullet 5 and to Table 3.9-10 which uses distance to the East Channel as a measure of potential impacts.
297	Birds	3-326	No	2	N/A	Please correct statement in bullet 3 that "Alternative 3 would result in the second highest amount of habitat loss" for consistency with Table 3.9-10. Recommend also providing a reference to Table 3.9-10 to point to information to support these statements.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
298	Birds	3-327	No	2	N/A	Please include reference to snowy owls as being present during winter, albeit in small numbers unless it is a high prey species year.
299	Birds	3-327	No	4	N/A	Please revise for accuracy "Estimates of aircraft and buses for transporting personnel to the Project are roughly half..." as no aircraft have been proposed for transporting personnel to the Project Area.
300	Birds	3-328	No	1	N/A	Recommend mentioning that habitat loss is unlikely due to ice infrastructure; alteration is possible, as written. Therefore, recommend changing 'would' to 'could' in last sentence.
301	Birds	3-328	No	4	N/A	The statement that alterations to bird habitat would be possible, minor, and short to medium term is not supported by the information provided in paragraphs 1 through 3. Paragraph 3 states that effects on wetter habitat types (flooded and wet) generally exhibit little to no effect from ice road construction and that these areas are favored by most water bird species. Areas with higher likelihood to show signs of disturbance support low densities of waterbirds (and are listed as habitat value 1 in Table 3.9-4). Based on this information, effects to bird habitat are unlikely and would only occur during construction (short term).
302	Birds	3-329	No	1	N/A	In first sentence, recommend revising "would" to "could" as soil and vegetation damage due to off-road travel is identified as unlikely to possible in Section 3.8.
303	Birds	3-329	No	3	N/A	Recommend removing or revising the statements "Water withdrawal from lakes has the potential to reduce their water levels and alter shorelines and islands used by nesting birds, which could make nests more susceptible to failure from abandonment or predation. Reduced water levels can also reduce fish prey on which some species of loons depend." Water withdrawal from lakes is an activity permitted by the ADNR, and permit stipulations are in place to avoid such occurrences.
304	Birds	3-329	No	4	N/A	Please review ABR technical memo to the USFWS (2015) regarding success of lake recharge and occupation of yellow-billed loon nest during construction activities.
305	Birds	3-331	No	1	N/A	Provide some definition of the size and location the dust shadow to include extent of the impact.
306	Birds	3-334	No	1	N/A	Recommend stating that yellow-billed loons are not currently habitat limited and referencing the multi-year studies conducted by ABR for the CRD and NPR-A.
307	Birds	3-335	No	2	N/A	Recommend changing "would possibly" to "could" as off road vehicle impacts are later described as "unlikely".
308	Birds	3-336	No	3	N/A	Recommend discussing whether the study cited regarding powerlines is directly applicable to the proposed project infrastructure (which does not include powerlines). Armstrong has specifically avoided use of powerlines in project design to avoid the impacts described here. Please focus on the effects of drill rigs, communications towers, and buildings.
309	Birds	3-336	No	3	N/A	The coastline has not been previously described as a bird migration corridor. Please add this information along with appropriate citations to the affected environment section to provide context for this impact finding.
310	Birds	3-336	No	3	N/A	Please provide additional context for this impact finding. For example, how often has the mortality of flocks occurred in the past. Furthermore, long term (defined as effect that would occur <u>consistently</u> for at least 30 years) is not appropriate for an infrequent event. The risk of an effect occurring would last for the life of the project but the effect itself is better described by the medium term definition (occur seasonally, periodically, or intermittently for more than 5 years). Recommend deleting "of flocks." Discussion in this same paragraph states that mortality would affect small numbers of individuals. "Flocks" is a subjective term that could range in size considerably.
311	Birds	3-337	No	2	N/A	Please revise Section 3.9.6.3.4 to clearly describe the effects likely to occur as a result of this Project with consideration for BMPs and other mitigation measures put into place.
312	Birds	3-338	No	5	N/A	Recommend framing the impact to habitats within the context of habitat value described earlier in the section. For example, Table 3.9-4 suggests that three of the four habitats listed would be lower value habitats (0-1).
313	Birds	3-340	No	2	N/A	This impact finding for spills does not consider the likelihood of a spill occurring and the likelihood of that spill reaching tundra habitat. Recommend revising the likelihood to unlikely to possible. This same comment applies to the spill impact finding in Table 3.9-9.
314	Birds	3-341	No	N/A	Table 3.9-9	Please reconcile the inconsistency in magnitude of effects for Attraction of predators. Table shows "moderate" while page 3-338, paragraph 3 states "minor to moderate".
315	Birds	3-341	No	N/A	Table 3.9-9	The last three rows of Table 3.9-9 (attraction to human activity, gravel mine sites and oil spills) are not effect categories but project effects. Effect categories are defined on page 3-297 and include only the top three rows of Table 3.9-9. The bottom three rows should be repositioned within the project effect column based on which effect category they fall under. That is, attraction to human activity would be disturbance and displacement, habitat loss from gravel mine sites would fall under habitat loss and alteration, disturbance and displacement from gravel mine sites would fall under disturbance and displacement, oil spills etc. would be split in three based on the effect category, as appropriate. This comment also applies to similar tables in Sections 3.10 (Table 3.10-11) and 3.11 (Table 3.11-9)
316	Birds	3-346	Yes	1	N/A	These bullets only repeat what is presented in the table. Recommend revising to summarize the important points and key differences between alternatives.
317	Birds	3-349	No	3	N/A	The identification of (implied negative) cumulative effects is inconsistent with the statement that most of the taxa identified by NRC as a concern for cumulative effects have increased over the last 10- and 30-year periods. If most bird populations are increasing, is a negative cumulative effect to bird populations occurring?
318	Birds	3-350	No	1	N/A	Cumulative effects to birds discussed in Section 3.9.6.5 Cumulative Effects and Climate Change (beginning on page 3-348) includes more than shifts in nesting distribution and increased predation. Recommend revising the bullets at the top of page 3-350 to better summarize the cumulative effects to birds described.
319	Birds	3-351	No	3	N/A	Please revise bullet 6 to more clearly reflect the related Applicant Proposed Mitigation Statement: "Discharge of domestic wastewater to the tundra at the project site is not planned during normal conditions."
320	Birds	3-351	No	3	N/A	Consider adding the avoidance measure: "Use the existing Deadhorse airport (rather than constructing a project-specific airstrip) to avoid impacts associated with regular fixed-wing air traffic in the Project area, including noise/disturbance of local residents, subsistence users, and wildlife."
321	Birds	3-351	No	3	N/A	Consider adding the mitigation measure: "Dust control measures will be implemented to reduce the incidence of dust on vegetation or snow." This measure is applicable given the discussion of dust shadow effects in Section 3.9.6.3.1.4, Gravel Infrastructure beginning on page 3-330.
322	Terrestrial Mammals	General	Yes	N/A	N/A	Section 3.10 does not include important relevant published literature on the distribution of caribou during the calving period, their energy expenditure, and potential impacts on the population. This section incorrectly infers a cause-effect relationship between oil and gas development and certain impacts or magnitude of impacts to caribou. For example, the literature suggests lower calving caribou density, but does not indicate absolute or consistent displacement or avoidance of infrastructure as is inferred by the text. It is also not accurate to infer a negative impact of energy expenditure as this hasn't been definitively proven in the literature.
323	Terrestrial Mammals	General	Yes	N/A	N/A	The extent, or geographical area of the impact, should be discussed for each effect category. Currently, discussion of extent is inconsistent throughout Section 3.10. The discussion of extent should use well defined and consistent terms. Extent should be discussed everywhere the impact criteria are discussed and impact conclusions are drawn. Examples include: 3-379, Para. 1; P. 3-379, para. 2; P. 3-381, para. 3; P. 3-385, para. 5; P. 3-386, para. 2; P. 3-387, para. 3; P. 3-388, para. 2; P. 3-390, para. 2; P. 3-390, para. 3; P. 3-391, para. 1; P. 3-391, para. 2; P. 3-392, para. 2; P. 3-393, para. 2; P. 3-394, para. 2; P. 3-394, para. 6
324	Terrestrial Mammals	3-353	No	2	N/A	Much of the information provided in paragraph 2 of Section 3.10.1 is repeated later on or is contradicted in Section 3.10.3. For instance, it is stated that "species of high cultural and economic importance that are hunted and trapped...are excluded from SGCN designation". However, in Section 3.10.3, the bulleted list of SGCN species includes species that are trapped or hunted and economically important species. Recommend limiting the discussion of SGCN species to Section 3.10.3 to avoid contradiction. Furthermore, their status as SGCN is not the key piece of information about terrestrial mammals. Their ecological importance and subsistence value could be discussed here (Section 3.10.1) while leaving the regulatory discussion in the appropriate section (Section 3.10.3).
325	Terrestrial Mammals	3-353	No	5	N/A	Suggest including citations for other air and ground surveys of caribou, such as (Pollard et al. 1996, Noel et al. 1998, 2004, and 2006).
326	Terrestrial Mammals	3-354	No	3	N/A	Please delete statement that begins with "Authorizations specific to terrestrial mammals would be required..." No specific authorization is required by the applicant or USACE to comply with the FWCA.
327	Terrestrial Mammals	3-354	No	2	N/A	Please include citations for fox studies such as (Ballard et al. 2000, 2001, 2003).

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
328	Terrestrial Mammals	3-356	Yes	N/A	N/A	Please check and revise figures for consistency. The depiction of the Mustang and Nuna DS1 Roads as "existing roads to be upgraded" is inconsistent among figures between Chapter 2 and Chapter 3 sections. In many cases they are shown in black as "existing roads to be upgraded" (Chapter 2: 2.3-7, 2.3-10, and 2.3-16; Water Quality: 3.7-1 and 3.7-2; Wetlands and Vegetation: 3.8-2, 3.8-9 through 3.8-26, 3.8-29 and 3.8-30; Birds: 3.9-3, and 3.9-5 through 3.9-8; Terrestrial Mammals: 3.10-1, 3.10-3, and 3.10-4; Marine Mammals: 3.11-1, 3.11-2, 3.11-3, and 3.11-4; Fish: 3.12-1 and 3.12-2; Land Ownership: 3.15-2 through 3.15-4; Cultural Resources: 3.16-1 and 3.16-2; Subsistence (all); Contaminated Sites: 3.19-1) while in others (Chapter 2: 2.3-1 and 2.3-13; Hydrology: Figure 3.6-1, 3.6-2, 3.6-4, and 3.6-5; Birds: 3.9-1, 3.9-2, and 3.9-4; Terrestrial Mammals: 3.10-2; Visual Resources: 3.13-1; Noise: 3.14-1; Land Ownership: 3.15-1) they are shown in red and/or green as part of Alternatives 3 and 4, respectively.
329	Terrestrial Mammals	3-359	No	2	N/A	Please indicate the source of habitat mapping described in this paragraph and shown in Figure 3.10-2. The added text describes the methods used to develop the mapping (i.e. classification system) but it is unclear if the mapping itself is the same as used in the Wetlands and Vegetation discussion, was developed by the USACE and its contractors for this DEIS, or if it is from some other source.
330	Terrestrial Mammals	3-359	No	1	N/A	It is important to note here that the number of calving caribou expected in the analysis area is a small proportion (~1%) of the CAH which contained 22,630 caribou in the 2016 census.
331	Terrestrial Mammals	3-361	No	3	N/A	Given the importance placed on caribou movements through the analysis area in consideration of potential environmental consequences, additional discussion of existing movements through the analysis area is warranted. From the text in the environmental consequences, it appears that caribou may move from south to north during and following calving season, from southwest to northeast during insect avoidance season (p. 3-384) and also west to northwest (p. 3-386). Movements along the East Channel are not described in the affected environment with the exception of references in the Traditional Knowledge quotes, but distance to the East Channel is used as a differentiating factor in description of impacts in Sections 3.10.6.4.1 through 3.10.6.4.4. It would be helpful to have general patterns of movement summarized to provide context for later discussions of effects and why some alternatives may result in more of an impact in terms of caribou movement than others.
332	Terrestrial Mammals	3-361	No	3	N/A	Cite the appropriate sources in Sections 3.10.5.1.1 through 3.10.5.1.7 and 3.10.5.1.9. These sections include numerous statements that are not supported by references.
333	Terrestrial Mammals	3-361	Yes	3	N/A	Text states that Teshekpuk Herd caribou 'regularly use' the Project area, even though telemetry data and aerial surveys indicate otherwise. It would be appropriate to state that the Central Arctic Caribou Herd use the CRD on a regular basis, especially during the summer. Studies have shown that the Teshekpuk Herd animals typically remain west of the Nigliq Channel while Central Arctic animals remain east of the channel.
334	Terrestrial Mammals	3-361	No	4, 5&6	N/A	To be consistent with other paragraphs, discussion about habitat use by those species in Sections 3.10.5.1.1 through 3.10.5.1.9 should reference whether that habitat usage occurs within the analysis area.
335	Terrestrial Mammals	3-361	No	3	N/A	Recommend stating that there has been considerable inter-herd movement and overlapping ranges of the Central Arctic herd with the Porcupine herd and the Teshekpuk herd (Lenart 2015, ADFG 2016, Cronin et al. 1997, 1998).
336	Terrestrial Mammals	3-363	No	3	N/A	Recommend referencing Table 3.9-6 in Birds, which provides information on the acreage of various habitat types within the region and provides context for the impacts described. This information is relevant to the impact findings as the availability of similar habitats in the analysis area is a consideration in the magnitude of impact.
337	Terrestrial Mammals	3-364	No	N/A	Table 3.10-4	Please provide information regarding the other 10 habitat types not included in this table either in a footnote or in the table itself as appropriate. It is unclear whether 10 habitat types (Shallow Open Water with Islands or Polygonized Margins; River or Stream; Sedge Marsh; Shallow Open Water without Islands; Tapped Lake with High-water Connection; Tapped Lake with Low-water Connection; Deep Open Water without Islands; Grass Marsh; Deep Open Water with Islands or Polygonized Margins; Deep Polygon Complex) were not included because they have a diversity of use index of 0 or for some other reason (e.g. not considered terrestrial habitats?). This information is relevant to understanding potential effects of the project on terrestrial mammal habitats.
338	Terrestrial Mammals	3-374	No	3	N/A	In first sentence, recommend replacing "permanent" with "long term" for consistency with impact criteria and to avoid statement that areas will never serve as habitat at any time in future. This comment also applies to bullet one on page 3-397.
339	Terrestrial Mammals	3-374	No	4	N/A	Recommend providing context that the two habitat types most affected (MTT and MSSW) are also the most prevalent in the study area, making up 40% of the total analysis area habitats. This information can be found in Table 3.9-6 in the Bird section, but is worth restating for the reader to provide important context for the impact.
340	Terrestrial Mammals	3-376	No	2	N/A	Please change "would" to "could" where appropriate on this page, for example: "...but <u>could</u> extend out to 328 feet..." "...of this habitat type in the survey area <u>could</u> be affected, depending on the alternative..." and "...which <u>could</u> attract caribou and possibly other mammalian herbivores in spring." This comment also applies to the discussions of other potential impacts in this section.
341	Terrestrial Mammals	3-379	No	1	N/A	The finding that habitat alteration from ice infrastructure would be long term ("Effect would occur consistently throughout the life of the Project and possibly afterward") is not supported by discussion in Wetland and Vegetation and Birds which state indicates that impacts may be visible up to 12 years but do not suggest that they would occur consistently for 30 years. Recommend that a short to medium term impact finding would be more appropriate and consistent given the short duration of ice road use during construction. This comment also applies to summary of impact in Table 3.10-11.
342	Terrestrial Mammals	3-380	No	3	N/A	The level of repetition and overlap, combined with general organizational issues in Sections 3.10.6.3.2.1.1 through 3.10.6.3.2.1.3 detracts from the overall readability of the sections. Recommend combining these into one section by condensing repetitive material.
343	Terrestrial Mammals	3-380	No	2	N/A	Please provide a citation for the "order of decreasing concern" provided in the bulleted list. If a reference is not available, recommend deleting this phrase.
344	Terrestrial Mammals	3-380	No	3	N/A	Bullet 3: Please revise as in increase in energy expenditure due to reactions to disturbance is not verified by research. It is also important to note that gravel roads and pads provide insect relief and early green-up forage which are positive for caribou and should be acknowledged.
345	Terrestrial Mammals	3-380	No	4	N/A	The issue of "calving displacement" presented in the DEIS (including Table 3.10-9) is not definitive and needs to be presented more empirically. The way it is currently presented in the text and in Table 3.10-9 (page 3-380) indicates that very large areas (e.g., 582 km ²) would be a "potential calving displacement zone within 4 km" of gravel infrastructure for Alternative 2. This is misleading because of the uncertainty of the extent of lower densities of calving caribou. Please refer to Noel et al. (2004) and Cameron et al. (1992) to correct inaccuracies in Section 3.10.6.3.2.1.1. Also suggest the terms "displacement", "avoidance", and "reduced/reduction" be replaced with "lower calving density" for accuracy and consistency with the literature. This comment also applies to the text at the top of page 3-359.
346	Terrestrial Mammals	3-381	No	2	N/A	Suggest revising "would" to "could" throughout this paragraph and revising the discussion of displacement as suggested in a previous comment.
347	Terrestrial Mammals	3-381	No	3	N/A	Suggest replacing "avoidance zones" with "areas with lower density of calving caribou" as it is more appropriate and accurate than avoidance zone.
348	Terrestrial Mammals	3-382	No	N/A	Table 3.10-9	The DEIS states that there is "displacement" out to 4 km from roads and facilities, and calculates "displacement zones" without adequately describing that some caribou calve within 4 km of roads and facilities, that the Cameron et al. (1992) data did not show significantly lower calf densities between 1 km and 4 km, and that Noel et al. (2004) did not find lower densities within 1 km or within 4 km of the Milne Point road. The observations of Cameron et al. (1992) and ABR (2004) indicate that calving caribou densities are sometimes lower within 1 km of roads, and there may be a trend of lower densities within 4 km, but these are not definitive results. Because calving displacement was only significant to 1 km, but a trend was observed to 4 km, assessing both distances may be appropriate.
349	Terrestrial Mammals	3-384	No	3	N/A	Recommend moving discussion of energy expenditure on pages 3-384 to 3-385 to Section 3.10.6.3.2.1.3 page 3-386 or, if combined, then to the appropriate part of that section.
350	Terrestrial Mammals	3-385	No	3	N/A	Please provide a citation for the statement "years of experience in the North Slope oilfields has demonstrated not all drivers observe these guidelines." If no citation is available and the statement is based on opinion, recommend it be deleted since it can not be substantiated.
351	Terrestrial Mammals	3-385	No	1	N/A	It is recommended that prior to the sentence "there is no consensus among caribou biologists..." that reference to increases to the population in the mid-2000s be made. These increases coincided with continued development in the Kuparuk River Unit and Colville River Unit.
352	Terrestrial Mammals	3-386	No	3	N/A	Recommend providing additional context that the Project and action alternatives are located in areas of relatively low maternal caribou density.
353	Terrestrial Mammals	3-386	No	3	N/A	If possible, recommend quantifying the number of caribou-vehicle mortalities in the existing North Slope oil fields to predict potential impacts for this project.
354	Terrestrial Mammals	3-386	No	3	N/A	Note here that the effect may lessen over time depending on the level of habituation of the calving caribou (see Noel et al. 2004).

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
355	Terrestrial Mammals	3-387	No	3	N/A	The finding that impacts to muskoxen are probable is not supported by the discussion presented above that states that little is known about the responses of muskoxen to facilities and activities, but that they cross under elevated pipelines. Recommend that a "possible" impact finding may be more appropriate. This comment also applies to summary of impact in Table 3.10-11.
356	Terrestrial Mammals	3-387	No	4	N/A	"Greatest distances" is vague. Please elaborate on what these distances are.
357	Terrestrial Mammals	3-388	No	2	N/A	Recommend deleting the sentence, "The Applicant would consider sensitive grizzly bear habitat and coordinate with ADF&G when finalizing the design of the pipeline alignment crossings over the Miluveach River to reduce potential effects to bears," as the Applicant has already done this (see Applicant's DA permit application).
358	Terrestrial Mammals	3-390	No	4	N/A	Recommend providing separate impact findings for the likelihood of vehicle strike mortality for caribou versus foxes and other terrestrial mammals discussed. Based on caribou's presence during the summer during a time of near 24-hour daylight, the fact that these animals tend to travel in groups, the low speed of vehicles, lack of visual obstructions, and safety measures that will be in place during all phases of the project, the potential for caribou strikes is unlikely to possible, not probable.
359	Terrestrial Mammals	3-391	Yes	3	N/A	Discussions on potential attraction to facilities, injury/mortality state that the potential for attraction of predators exists for all development phases, when in fact grizzly bears are not active during winter construction. As written it is implied that bears would be present year round. Please revise for clarity.
360	Terrestrial Mammals	3-392	No	1	N/A	Recommend revising statement "A predator management plan" to "A Wildlife Avoidance and Interaction Plan would be developed" consistent with Armstrong's Project Description and Chapter 2.3.2.8.
361	Terrestrial Mammals	3-392	No	3	N/A	The first sentence of this paragraph cites studies where organic refuse is abundant. It is not clear that this is describing expected conditions at the proposed Project considering applicant-proposed mitigation and best management practices. Please revise this discussion to describe expected effects of the project as proposed including proposed mitigation.
362	Terrestrial Mammals	3-393	No	2	N/A	Recommend revising the magnitude of impact to grizzly bears resulting from attraction to human activity and facilities to "minor," as the analysis does not take into account the Applicant's proposed mitigation measures to avoid impacts. If effects occurred, they would likely only affect individual bears and not the population as a whole.
363	Terrestrial Mammals	3-394	No	4	N/A	Please provide context for this discussion by clarifying that spills of hydrocarbons and other fluids have potential to degrade terrestrial mammal habitats if they reach those habitats. As described in Chapter 4.0, the majority of spills likely to occur would be contained on a gravel pad or road and would be unlikely to impact terrestrial mammal habitats.
364	Terrestrial Mammals	3-394	No	5	N/A	The language used to describe the likelihood of a spill occurring (i.e., "risk" and "probable") is not consistent with Chapter 4.0. Use consistent terminology (e.g., "low") to avoid confusion with the likelihood of impacts to the resource should a spill occur.
365	Terrestrial Mammals	3-396	No	N/A	Table 3.10-11	Bottom right cell: small spill is a short to medium term duration effect according to text.
366	Terrestrial Mammals	3-397	No	N/A	Table 3.10-12	Under "multiphase pipeline" please clarify why multiphase pipelines have potential for attraction for insect relief, and clarify if this would also apply to export pipelines. This distinction is not clear from the discussion in Section 3.10.6.3.4.1.
367	Terrestrial Mammals	3-398	Yes	1	N/A	The summary of impacts by alternative is not informative. The multiple pages of bullets repeat information already in tables provided previously in the section and do not clearly communicate meaningful differences between alternatives. The descriptions of effects of roads and pipelines on caribou movement are confusing without a better understanding of general caribou movements through the analysis area. Finally, the discussion of areas of potential calving displacement does not clearly consider observed densities of maternal caribou and calves in the areas affected. Please revise for clarity.
368	Terrestrial Mammals	3-398	No	1	N/A	Bullets 2 and 4: this is the first discussion of the river as a travel corridor. This should either be expanded upon here in a narrative form (non-bulleted), or added somewhere in previous text.
369	Terrestrial Mammals	3-398	No	2	N/A	The term "corralling" is used on multiple occasions regarding caribou within the DEIS. This term is not defined in the document and we are unaware of its documentation in either the peer-reviewed literature, agency or commercial reports, or other sources. Please define "corralling" and distinguish it from other terms used in the caribou-behavior literature such as "deflection, or delayed road-crossing." If it cannot be defined or documented in the literature, we recommend deletion of the term. This comment also applies to p. 3-646, para 1.
370	Terrestrial Mammals	3-404	Yes	2	N/A	Throughout the Terrestrial Mammals Cumulative Impact section, the description of potential future development appears to be speculative and not based on the RFFA's described in Section 3.1. For example, in paragraph 5 on page 3-405, the potential impacts of further expansion "to the southwest as a result of construction of additional projects for prospects to the south of the project and the CRD" is discussed but it is not clear if this statement refers to a specific RFFA identified. Please identify the specific RFFA discussed or if no RFFA has been identified in this area, please delete this discussion as speculative. Similarly, discussion in paragraph 3 of page 3-406 describes states "The presence of additional development infrastructure may eventually negatively affect some terrestrial mammal populations if development reaches the point where suitable alternative habitats are not available." This statement again appears to be based on conjecture and not on the specific list of RFFA's identified in Section 3.1. We recommend that the author consider the reasonably foreseeable future development actions identified within the context of available habitats and suggest that it is highly unlikely that these actions would result in suitable alternative habitats becoming unavailable.
371	Terrestrial Mammals	3-404	Yes	2	N/A	Recommend clarifying the rationale for the cumulative effects analysis including the entire North Slope for terrestrial mammals.
372	Terrestrial Mammals	3-404	No	3	N/A	Please revise terminology. The east and west 'segment' terminology is not valid, and east and west 'calving areas' is more accurate (see Arthur and Del Vecchio 2009). Studies have shown movement of calves between the east and west areas (e.g., Arthur and Del Vecchio 2009), so the units are geographic areas, not sub-herds of the CAH. See Cronin et al. (1997, 2000) and Arthur and Del Vecchio (2009) for research on this topic.
373	Terrestrial Mammals	3-405	Yes	1	N/A	Please provide additional context for potential cumulative impacts on terrestrial mammals by discussing current population trends. For example, this paragraph mentions population decreases of the CACH but there is no mention of the increase in population of the CACH in the mid-2000s. Omitting a critical piece of information about caribou and infrastructure interaction.
374	Terrestrial Mammals	3-405	No	3	N/A	The last sentence incorrectly infers that loss of habitat may result in effects on productivity and abundance of caribou. This is speculation and is not supported by the growth of the CACH population during the growth of North Slope oil development.
375	Terrestrial Mammals	3-406	No	3	N/A	Explain why the alteration of 17,770 acres of tundra habitat differs in number from the 10,835 acres of gravel placement and extraction cited two pages prior.
376	Terrestrial Mammals	3-409	No	1	N/A	Please revise the "Applicant's Mitigative Measures" to more clearly reflect the Applicant's Proposed Mitigation Statements provided in the July 2017 DA Permit Application Package. These include: p. 3-409, bullet 7 - revise to "Discharge of domestic wastewater to the tundra at the project site is not planned during normal conditions." p. 3-409, bullet 8 - specify brown bear denning habitat for consistency with Applicant Proposed Mitigation Statement.
377	Terrestrial Mammals	3-409	No	1	N/A	Consider adding the measure: Install power and fiber-optic cables on HSMs using messenger cables to avoid the use of overhead powerlines, which have the potential for bird strikes and provide perching locations for predators.
378	Terrestrial Mammals	3-392	Yes	1	N/A	Revise reference to "predator management plan" to "Wildlife Avoidance and Interaction Plan" for consistency with Applicant Proposed Mitigation Statements.
379	Marine Mammals	General	Yes	N/A	N/A	Please check the use of "stock" or "subpopulation" or "DPS" as applicable for consistency with MMPA and ESA designations.
380	Marine Mammals	General	Yes	NA	N/A	In order to better support conclusions, provide citations where factual information is currently provided without support from a referenced source.
381	Marine Mammals	General	Yes	NA	N/A	The extent, or geographical area of the impact, should be discussed for each effect category. Currently, a discussion of extent is inconsistent throughout Section 3.11. The discussion of extent should use well defined, consistent terms. Extent should be discussed wherever the impact criteria are discussed and impact conclusions are drawn. Examples include: P. 3-435, para. 1; P. 3-435, para. 2; P.3-436, para. 2; P. 3-436, para. 3; P. 3-438, para. 2; P. 3-439, para. 2; P. 3-440, para. 1; P. 3-440, para. 2; P. 3-442, para. 2; P. 3-442, para. 3; P. 3-444, para. 3; P. 3-445, para. 1; P. 3-446, para. 2; P. 3-447, para. 2; P. 3-447, para. 3; others are also pointed out in other comments.
382	Marine Mammals	General	Yes	NA	N/A	Recommend expanding discussion of the regulatory framework in Section 3.11.3 to provide more detail on the distinct regulatory roles of the ESA and MMPA and the different permitting needs associated with each statute. To the extent consultation is complete, the Final EIS should incorporate any new information on the species that arises in consultation.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
383	Marine Mammals	3-416	No	N/A	Figure 3.11-2 and Figure 3.11-3	Analysis area in Figures 3.11-2 and 3.11-3 does not match analysis area in Figure 3.11-1 and Figure 3.11-4. Please revise for consistency.
384	Marine Mammals	3-417	No	1	N/A	Item number 4 does not match the others because the effect to the species includes items 1 through 3. Recommend removal of item 4.
385	Marine Mammals	3-418	No	N/A	Table 3.11-3	Suggest adding impacts to water quality from screening at Oliktok Dock as discussed on page 3-479 and 3-480 in Section 3.12.6.3.1.2.
386	Marine Mammals	3-421	No	N/A	Table 3.11-4	Humpback whales in the Beaufort could be members of the endangered Western North Pacific DPS, the threatened Mexico DPS, or the recently delisted Hawaii DPS. Please update the table to reflect this and cite the FR, Wade et al. 2016, and NMFS guidance from Dec. 12, 2016. Add MMPA status, and define DPS in notes below table.
387	Fish and Invertebrates	3-421	Yes	N/A	Table 3.11-4	The USFWS recently made a decision not to list the Pacific walrus under the ESA. Please remove from this table and elsewhere in the text describing ESA species, including the technical memo in Appendix VIII.3.
388	Marine Mammals	3-421	No	N/A	Table 3.11-5	Recommend a water depth be included in parentheses next to the phrase (shelf waters) as the preferred depths differ by species. It should be noted that the preferred habitat for species such as beluga and bowhead whales is well outside the analysis area.
389	Marine Mammals	3-421	No	N/A	Table 3.11-5	The timing of bowhead whale movements should mirror (Beaufort Sea) belugas as the Western Arctic bowhead whales and Beaufort Sea belugas travel north along open leads about April time period, moving east through the Beaufort to the McKenzie delta area where they feed until returning in late August/September. The eastern Chukchi Sea belugas move into the Chukchi Sea in June and travel to areas north of Barrow.
390	Marine Mammals	3-422	Yes	1 thru 4	N/A	Please provide a citation for the information presented in the first paragraph regarding polar bear behavior. Please also provide a citation for information presented in the first half of the second paragraph regarding demographics. Finally, please provide a citation at the end of the fourth paragraph where it is stated that some females den farther inland.
391	Marine Mammals	3-423	No	1	N/A	Recommend relocating the discussion of the MMPA to Section 3.11.3, as the MMPA applies to all marine mammals discussed in this section, and the discussion of the ESA either to the same section or to the beginning of Section 3.11.5.1 as it applies to all marine mammals protected under the ESA. Additionally, please note that there are differences in the definition of "take" under the ESA and MMPA. Finally, the MMPA does not "take precedence" over the ESA on issues related to incidental take, but where a species is protected under both statutes, the incidental take process under the ESA generally takes place during the incidental take permitting process under the MMPA.
392	Marine Mammals	3-423	No	3	N/A	Bullet 2: Recommend revising the description to avoid confusing terrestrial denning critical habitat with potential denning habitat; also make note of the boundary of this critical habitat (i.e., the 5-mile buffer from the coast based on 95% of dens).
393	Marine Mammals	3-423	No	2	N/A	Please clarify if 32 bears is the harvest rate per year between 2004 and 2008 or the total harvest for the five year period. If the latter, please explain where the other harvest comes from such that it currently exceeds 22 per year.
394	Marine Mammals	3-425	No	N/A	Figure 3.11-3	Denote the designated Critical Habitat as separate from other habitat in the legend. Specifically, the green terrestrial denning habitat should include 'critical' prior to 'habitat' and potential denning habitat should include 'terrestrial' prior to 'denning'.
395	Marine Mammals	3-427	No	2	N/A	Please provide which DPS of spotted seal is found in the analysis area; in the last sentence, replace "near the Project" with "in the Analysis Area." Reference Figure 3.11-4 where the haulouts are shown.
396	Marine Mammals	3-429	Yes	1	N/A	Please reference data collected through BOEM's surveys and/or the satellite telemetry data collected by the NSB Department of Wildlife Management.
397	Marine Mammals	3-431	Yes	4	N/A	Please remove climate change from the discussion of direct and indirect impacts in Environmental Consequences. Climate change is not a proposed action of the Applicant. Therefore, it should be discussed in the Cumulative Effects and Climate Change section, consistent with the other sections of the EIS. Recommend moving discussion of the existing environment with respect to climate change (currently in Section 3.11.6.2 in the Environmental Consequences) to Section 3.11.6.6. Discussion of the cumulative effect of climate change is scattered throughout the discussion of the direct and indirect effects of the proposed project (i.e. on page 3-439, paragraph 4 and 5; page 3-440, paragraph 1; 3-447, paragraph 4, etc.) and should be relocated to 3.11.6.6.
398	Marine Mammals	3-431	No	1	N/A	In bullet 1, recommend stating that the majority of the area affected by placement of gravel fill is located outside of critical habitat (where the vast majority of denning occurs). This information provides important context regarding the magnitude of potential impacts from gravel fill placement. The fact that suitable denning habitat occurs in the vicinity of the proposed project does not necessarily mean that it is used as commonly as potential denning habitat within 5 miles of the coast.
399	Marine Mammals	3-434	No	4	N/A	Recommend adding the word "terrestrial" after "potential" in "potential denning habitat."
400	Marine Mammals	3-434	No	5	N/A	78 FR 11766 stipulates a 1-mile no-construction buffer around dens, not infrastructure.
401	Marine Mammals	3-434	yes	1	N/A	Please change "would" to "could" in discussion of differences between alternatives that "could" occur ("would" implies certainty)
402	Marine Mammals	3-435	No	1	N/A	It is not necessary to state that impact criteria conclusions are dependent on Applicant committed measures or existing regulation because adherence to both is assumed as part of the proposed action.
403	Marine Mammals	3-435	No	2	N/A	Revise this paragraph starting at the second sentence to make it clear that year-round habitat loss would not occur and what is meant by 'perennial habitat loss' is the successive seasonal loss of the same area of potential denning habitat.
404	Marine Mammals	3-436	No	3	N/A	Recommend deleting discussion of potential impacts of bridge abutments on spotted seal habitats due to changes in water flow, sedimentation, or ice blockage during breakup. Section 3.11.5.2 does not indicate that there is evidence that spotted seals swim up the Kachemach or Miluveach Rivers. The bridges are several miles upstream and if they were to occur, any effects on hydrology would likely not be detectable at seal haulouts 7 to 18 river miles downstream. Furthermore, the potential for effects due to ice blockages would occur during breakup, and seals typically arrive in the CRD starting in July in low numbers, with larger numbers in August and September. Therefore, seals would not be there during the time when impacts related to hydrology would be most likely to occur. Increased velocities would only occur during highest flow levels. While NEPA requires disclosure of potential effects, this effect is negligible and discountable and does not warrant discussion.
405	Marine Mammals	3-437	No	3	N/A	Recommend revising text to state, "noise levels are detectable above background levels up to 1.2 miles from the noise source."
406	Marine Mammals	3-437	No	3	N/A	Paragraph 3 describes noise effects related to helicopters but use of helicopters (including the timeframe of use, seasonality and differences between alternatives) is not described anywhere else in this section. Recommend discussing use of helicopters during July/August during construction for all alternatives and for pipeline monitoring for Alternative 4 through the life of the project.
407	Marine Mammals	3-437	No	2	N/A	Recommend noting that while the Project area contains potential denning habitat, denning may not actually occur here because there is substantial denning habitat elsewhere.
408	Marine Mammals	3-438	No	2	N/A	Please describe why noise from pile driving would be perceived by bears in dens up to 0.8 miles away and explain where this number came from. Also note that displacement from foraging habitat is unlikely since foraging occurs on sea ice.
409	Marine Mammals	3-439	No	3	N/A	The statement "The net direction of movement by maternal females leaving terrestrial denning areas with young cubs is northward, requiring crossing roads and pipelines" is incorrect. The majority of polar bear terrestrial dens near the analysis area would be in designated terrestrial denning critical habitat which is located within 5 miles of the coast and located north of all proposed roads. Proposed roads would not impede travel of most polar bears between denning and foraging areas.
410	Marine Mammals	3-439	No	3	N/A	The last two sentences are contradictory. It is stated that encounters with bears are likely, but disturbance is unlikely. This may be as simple as changing the word "encounter" to "observation" of a polar bear, which may not imply an interaction, and which would not likely result in some sort of impact to that individual.
411	Marine Mammals	3-439	No	4	N/A	The use of "short term" on the third, fourth and sixth line of this paragraph has a different meaning than 5 years as it was defined as an impact criterion in Table 3.11-2. Recommend using a different term here and wherever impact criteria are used out of context. The last sentence discusses cumulative impacts and should be moved to that section.
412	Marine Mammals	3-439	No	4	N/A	Please change "would" to "could" in the first sentence.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
413	Marine Mammals	3-439	No	4	N/A	Recommend editing as follows: " Temporary behavioral responses would not likely have population-level effects and, thus, would be considered less problematic than den disturbance (USFWS 2008, 2009)." Den disturbance has already been described as a minor (and thus not population-level) effect making the comparison between the two confusing and potentially misleading.
414	Marine Mammals	3-439	No	5	N/A	Recommend revising first sentence to remove doubt that stipulations of the ITR and Polar Bear Interaction Plan would be implemented. As part of the proposed action, these measures will be implemented.
415	Marine Mammals	3-440	No	1	N/A	Recommend revising last sentence to better summarize the disturbance/displacement effects to polar bears. Some effects are short term while others are long term, so the existing summary is misleading. Also please change "would" to "could" where appropriate in this paragraph.
416	Marine Mammals	3-442	No	3	N/A	Recommend that disturbance and displacement of marine mammals due to barging is best described as possible rather than probable based on discussion in this paragraph.
417	Marine Mammals	3-444	No	1	N/A	Recommend that the discussion of "physiological damage" be reserved for the injury and mortality section. Background and ambient are the same. Define the limited extent. Provide a brief but clear discussion of the extent of the Project effect.
418	Marine Mammals	3-444	No	4	N/A	Recommend replacing marine mammals in the first sentence with polar bears since this project effect would not result in impacts to other marine mammal species.
419	Marine Mammals	3-444	No	4	N/A	Recommend providing additional justification for long term impact or consider revising to medium term. The risk of a vehicle strike occurring would occur for the life of the project but the effects on the population of one actually occurring would not last that long. It is also worth noting that a polar bear-vehicle collision has never occurred, to the best of our knowledge. Medium term (seasonally or periodically for more than five years) seems appropriate.
420	Marine Mammals	3-446	No	4	N/A	The first sentence states that "virtually no lethal take" has been reported, but the second sentence states that "three polar bears have been killed." Resolve these contradictory statements.
421	Marine Mammals	3-446	No	4	N/A	It is not clear if the other bear fatalities in the last few sentences were associated with defense operations or industrial, and what industrial operations those were. Please make clear if the fatality was associated with oil and gas activities.
422	Marine Mammals	3-446	No	3	N/A	Section 3.11.6.4.3.3 Attraction to Human Activity and Facilities and Section 3.11.6.4.3.4 Human-Bear Interactions repeats much of the same information about the ITR/LOA process and potential for hazing and/or take. Recommend combining these into a single discussion. The two effects are almost identical and should be combined to improve readability, comprehension of conclusions, and clarity of potential effects.
423	Marine Mammals	3-447	No	3	N/A	Remove the sentence "Provided that required mitigation measures are followed as prescribed by the ITRs (81 FR 52319)..." Those measures are required by regulation and it should be assumed that they are followed.
424	Marine Mammals	3-447	No	4	N/A	"Pose a problem" is subjective and ambiguous language. Please remove or revise. Furthermore, this paragraph is in disagreement with the previous conclusions of mortality of a single or few individuals would be a minor magnitude effect. Please consider revising this paragraph for consistency with the rest of the section and clearly discuss what removal of one individual could mean for the population.
425	Marine Mammals	3-447	No	5	N/A	Recommend replacing "can be high" with "exists" as the text above does not describe a high rate of injury or mortality for polar bear.
426	Marine Mammals	3-448	No	1	N/A	Please revise the last sentence to indicate the likelihood of a fuel spill using terminology consistent with Chapter 4.0 (e.g., "low") rather than a term used for impact magnitude (i.e., "minor").
427	Marine Mammals	3-448	No	2	N/A	The language used to describe the likelihood of a spill occurring (i.e., "risk" and "probable") is not consistent with Chapter 4.0. Use consistent terminology (e.g., "low") to avoid confusion with the likelihood of impacts to the resource should a spill occur.
428	Marine Mammals	3-448	No	2	N/A	Please remove "probable" from the sentence "Overall, effects from oil spills and accidental releases on polar bears and their habitat would be unlikely to probable (depending on the location and season of the spill), minor to major, and short to medium term for a large spill and unlikely, minor, and short term for a very small to small spill." The potential for a large spill to occur is very low, thus impacts related to a large spill cannot be probable.
429	Marine Mammals	3-450	No	N/A	Table 3.11-9	Add project effects under disturbance and displacement, including those discussed in Section 3.11.6.4.2.1. There are several project effects listed in that section with their own criteria listed for each, some of which are different. Also missing from disturbance/displacement is gravel resources impacts to polar bears which is described on page 3-440. Combine the bottom three rows under injury and mortality as they are related to the same project effect. Under oil spills, medium size spills are omitted.
430	Marine Mammals	3-450	Yes	1	N/A	The bulleted lists in Section 3.1.6.5 are not effective at describing the important differences between alternatives. Recommend replacing with a concise narrative that compares the alternatives with a focus on the most important differences.
431	Marine Mammals	3-451	No	2	N/A	The statement that Alternative 2, 4, and 5 would all have the same amount of denning polar bear habitat directly lost to gravel fill is not consistent with Table 3.11-6 which shows Alternative 2 and 4 having the same amount (<0.1) and Alternative 3 and 5 having the same amount (0.1). Please revise for consistency. This comment also applies to similar statements on page 3-452, paragraph 3, and 3-453, paragraph 2.
432	Marine Mammals	3-452	Yes	1	N/A	Bullet 2, recommend deleting the last sentence regarding marine mammal use of rivers and streams within 200 feet of pipelines as this is an oversimplification and is not supported by discussion of habitat use in the analysis area. Furthermore, discussion of spills to flowing waters being transported over a wider area should be identified as a worst case scenario. Similar comment also applies to page 3-452, paragraph 2, bullet 4; page 3-453, paragraph 1, bullet 3; and page 3-454, paragraph 1, bullet 1.
433	Marine Mammals	3-454	No	2	N/A	The "North Slope" is generally considered to consist of only onshore areas. To be more accurate, recommend the cumulative effect analysis area include the nearshore marine waters associated with the screening area.
434	Marine Mammals	3-454	Yes	4	N/A	The cumulative effects section states "expansion of oil and gas development along the Arctic coast on both land and sea may reach a level at which such effects become problematic for polar bears in the future (Amstrup 2003; USFWS 2009)." However, it is not clear which RFFA's are being described in this statement as few coastal and no offshore projects are listed as RFFA's in Table 3.1-1; thus it is unlikely that these projects would result in the cumulative impact described. Please list specific RFFA's or delete this statement as speculative. This general comment applies to all discussion of offshore oil and gas exploration and development described in this section.
435	Marine Mammals	3-454	No	4	N/A	"Problematic" is a vague and speculative term. Recommend deleting the last sentence or saying that, with mitigation and regulation, there may not be population-level impacts with future developments.
436	Marine Mammals	3-455	No	1	N/A	Mortalities (and stress) resulting from wildlife research (tranquilizing, hazing from the air, assessing dens, etc.) could be quantified from USFWS and USGS data. If a significant portion of the population is captured etc., that could constitute a much greater disturbance than noise from facilities. Subsistence hunting mortalities should also be reference (see p. 3-423).
437	Marine Mammals	3-457	Yes	2	N/A	Please identify specific past, present, or reasonably foreseeable future offshore oil and gas projects that are being evaluated in this section.
438	Marine Mammals	3-458	Yes	2	N/A	Please identify specific past, present, or reasonably foreseeable future natural gas development projects that are being evaluated in this section.
439	Marine Mammals	3-392	No	3	N/A	Please revise the "Applicant's Mitigative Measures" to more clearly reflect the Applicant's Proposed Mitigation Statements provided in the July 2017 DA Permit Application Package. The one measure listed is not in the Applicant Proposed Mitigation Statements.
440	Marine Mammals	3-459	No	3	N/A	Consider adding as an avoidance measure: "Existing barge infrastructure at Oliktok Point will be used to avoid the need to construct new marine facilities to support sealift delivery."
441	Marine Mammals	3-459	No	1	N/A	Most of the measures listed in Section 3.11.7 are not from the North Slope Environmental Field Handbook (NSTC 2011) and most are not typical mitigative measures. Recommend deleting the four bullets in Section 3.11.7 and replacing with those measures listed on pages 40-42 of the field handbook. It is also appropriate to mention regulations included in the ITR. However, many of the "BMPs" and "industry standards" listed here are not typical and are from a variety of disparate sources.
442	Fish and Invertebrates	General	Yes	N/A	N/A	The extent, or geographical area of the impact, should be discussed for each effect category. Currently, a discussion of extent is inconsistent throughout Section 3.12. The discussion of extent should use well defined, consistent terms. Extent should be discussed wherever the impact criteria are discussed and impact conclusions are drawn. This comment also applies to page 3-482 paragraph 3, page 3-483 paragraph 3, page 3-484 paragraph 1 and 3, page 3-485 Table 3.12-6.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
443	Fish and Invertebrates	3-461	No	2	N/A	Recommend confirming locations described for existing development within Kalubik Creek Drainage. The Alpine Sales Pipeline and gathering lines from KRUDS3S cross Kalubik Creek, not the Kugaruk Sales Pipeline. Similarly, Kugaruk CPF2 is located east of Kalubik Creek. Comment applies to identical text on page 3-469.
444	Fish and Invertebrates	3-462	No	N/A	Figure 3.12-1	Recommend clearly describing the boundary of the analysis area, and including it in the figure. Recommend providing a better description of the analysis area in Section 3.12.4.1.
445	Fish and Invertebrates	3-462	No	N/A	Figure 3.12-1	Please define AWC and provide a data source for AWC and permitted lakes data.
446	Fish and Invertebrates	3-464	No	N/A	Table 3.12-1	Recommend revising definition of minor and moderate impacts to avoid use of duration (long term, short term) as duration is an independent impact category.
447	Fish and Invertebrates	3-465	No	N/A	Table 3.12-2	Please add analysis or quantification of water removal/loss to the first row, right column.
448	Fish and Invertebrates	3-471	No	N/A	Table 3.12-4	Recommend clarifying source of information of the Kachemach River as a beaded stream. Within the Project area, it is a meandering stream with alluvial deposits on point bars in the lower reaches of the river. Based on imagery, it has some beaded stream characteristics more than 10 miles up gradient of the Alpine Sales Pipeline Crossing.
449	Fish and Invertebrates	3-474	No	N/A	Figure 3.12-2	Please show the boundary of the analysis area.
450	Fish and Invertebrates	3-478	Yes	1	N/A	Bullet 2 - Please provide a spatial extent for the impact described.
451	Fish and Invertebrates	3-479	No	3	N/A	Last sentence. Please define the dust shadow area and clarify which streams and how far downstream effects could occur. Provide a clear description of extent of the impact.
452	Fish and Invertebrates	3-479	Yes	3	N/A	Please include a distance of fugitive dust dispersion must be included, similar to Section 3.4 which is referenced here; i.e., 100m. Important to include that distance here for clarity. Not all fish bearing streams/lakes in the analysis area will be affected by fugitive dust from gravel infrastructure.
453	Fish and Invertebrates	3-480	No	3	N/A	Define "further downstream" in terms of distance and which streams. Provide a clear description of extent of the impact. This comment also applies to page 3-481 paragraphs 1 and 2.
454	Fish and Invertebrates	3-481	No	3	N/A	Recommend substantially revising this paragraph to provide more specific information regarding the proximity of potential pile driving locations to overwintering habitat as is provided in the similar discussion on page 3-483, paragraph 3. Recommend revising impact finding to minor as it is incongruous that injury or mortality could be moderate when disturbance or displacement is minor. Recommend also noting that the neither the Miluveach or Kachemach River likely provides significant overwintering habitat as both rivers likely freeze to the bottom in most locations.
455	Fish and Invertebrates	3-481	No	3	N/A	In the third sentence "206 dB of sound" should be changed to "noise in excess of 206 dB" may radiate "up to" 33 feet...
456	Fish and Invertebrates	3-482	No	3	N/A	Discussion of in-water noise from blasting is not necessary here because blasting at mine sites would occur on land.
457	Fish and Invertebrates	3-483	No	1	N/A	Recommend clarifying why effects would be limited to the screening area as the text in the paragraph states that noise is detectable in a larger spatial extent.
458	Fish and Invertebrates	3-485	No	3	N/A	In the last sentence, recommend clarifying that effects would be unlikely due to the very low probability of a marine spill occurring (see Chapter 4, Table 4.2-3).
459	Fish and Invertebrates	3-486	No	N/A	Table 3.12-7	Medium spills are missing from oil spills effect category.
460	Fish and Invertebrates	3-486	No	N/A	Table 3.12-17	The fugitive dust discussion should include the distance from gravel infrastructure of the dust shadow, for clarity.
461	Fish and Invertebrates	3-487	No	N/A	Table 3.12-8	Please clarify value "number of lakes with potential overwintering habitat in the analysis area" as it does not provide any information differentiating alternatives. Recommend revising to indicate number of lakes with potential overwintering habitat within 328-foot or some other biologically relevant measurement of each alternative.
462	Fish and Invertebrates	3-487	No	N/A	Table 3.12-8	Recommend revising "affects overwinter fish habitat," "affects anadromous fish habitat" and "affects summer rearing and feeding habitat" to clarify what the project element causing the effect actually is. As written, no clear effect is being described.
463	Fish and Invertebrates	3-489	No	1	N/A	Recommend providing justification as to why the entire North Slope is a relevant area of analysis for fish resources. Also recommend referring to specific RFFAs as described in Table 3.1-1 to avoid potentially speculative statements regarding future impacts.
464	Visual and Aesthetic Resources	3-493	Yes	1	N/A	Throughout this section, recommend using the terms "fewer overlapping subsistence use areas" and "greater overlapping subsistence use areas" (for consistency with terms used in Section 3.17) in place of terms like "concentrated use," "less concentrated use" and "more concentrated use."
465	Visual and Aesthetic Resources	3-494	No	2	N/A	The regulatory framework section should include a discussion of any relevant laws regarding visual resource management, and if none, the section should state there are none.
466	Visual and Aesthetic Resources	3-494	No	3	N/A	Please specify which (whose) established visual resources assessment methodology uses an outer limit of 15 miles (USACE, BLM, USFWS, other).
467	Visual and Aesthetic Resources	3-498	No	1	N/A	Please reconcile the definition of summer and winter as stated in this paragraph with use of the terms provided in Sections 3.2 and 3.5. The dates provided here on page 3-498 refer to periods of 24 hr. nights/24 hr. days (as discussed in Section 3.5 on page 3-84), not summer and winter seasons. As defined in Section 3.2 (page 3-20) summer is generally defined as May through September while winter is defined as October through April.
468	Visual and Aesthetic Resources	3-499	No	N/A	3.13-2, 3.13-5, 3.13-6, 3.13-7, 3.13-8	Recommend the captions of photographs of industrial facilities identify the facility, where the photo was taken from (direction and elevation, if from an aircraft, as a typical viewer would not normally have this perspective) and at what distance. For example, Figure 3.13-7 is 1.6 miles, and Figure 3.13-6 is approximately 6 miles.
469	Visual and Aesthetic Resources	3-505	No	1	N/A	In last sentence, recommend deleting "major" as no major impacts have been identified. "Key" may be a more appropriate term.
470	Visual and Aesthetic Resources	3-506	No	6	N/A	Please revise this discussion to clarify that the majority of construction activities and gravel hauling will occur during winter, minimizing dust impacts.
471	Visual and Aesthetic Resources	3-508	No	3	N/A	Recommend deleting the sentence starting "Although the Applicant would attempt to capture the gas..." as this is factually incorrect. The removal of this sentence does not affect the other statements made in this paragraph.
472	Visual and Aesthetic Resources	3-511	Yes	2	N/A	Please revise to reflect that (1) the ASRC Mine Site and NSB Mine Site are not part of the proposed action and that direct impacts related to those sites are considered as part of the cumulative impacts analysis, but that transportation to and from those sites is considered as a direct project impact; and (2) Mine Area D would be a connected action if it is developed.
473	Visual and Aesthetic Resources	3-512	No	1	N/A	Recommend clarifying that spills to pads would be recovered with little to no visual impact.
474	Visual and Aesthetic Resources	3-512	No	3	N/A	Recommend revising to clearly indicate the likelihood of such spills occurring: "These contrasts would be probable, localized and minor, and short term in the event of a small to medium-sized spill, but they would be probable, major, and medium to long term in the very unlikely event of a large to very large release." Recommend adding similar information regarding spill likelihood to the final summary sentence.
475	Visual and Aesthetic Resources	3-517	Yes	3	N/A	Please add conclusions to the combined cumulative and climate change section
476	Visual and Aesthetic Resources	3-518	No	6	NA	Please revise bullet 2 to reflect the Applicant Proposed Mitigation Statement: "Impacts to subsistence use areas will be minimized through location of project facilities (including the Miluveach River Bridge) away from subsistence use areas near the mouth of the Miluveach River."
477	Visual and Aesthetic Resources	3-519	No	1	N/A	Recommend adding Applicant's proposed mitigation measure: Dust control measures will be implemented to reduce the incidence of dust on vegetation or snow.
478	Noise	3-521	No	2	N/A	Recommend removing "air transportation" from the bulleted list as it is not a "major Project component." Recommend revising text to note that air transportation (FBX to Deadhorse) is not part of the Project. Please clarify frequency and seasonality of use.

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479	Noise	3-522	No	4	N/A	Recommend noting NSB Municipal Code 19.70.050 regarding local noise restrictions.
480	Noise	3-524	No	2	N/A	The analysis area appears to be a consistent/uniform distance around project facilities instead of based on the location of Nuiqsut, Helmericks Homestead, and areas of high subsistence use. If so, please state so.
481	Noise	3-524	Yes	2	N/A	Recommend providing geographic context to clearly explain where activities occur and where sensitive users are located. i.e. Transportation via fixed-wing aircraft of people and cargo to/from Deadhorse is outside of the project area and the EIS. Additionally, the section text uses generic references to "areas used for subsistence." Please specify with references to maps, tables, or descriptions in Section 3.17 to identify what area is being referenced.
482	Noise	3-525	No	3	N/A	Recommend replacing term "major concern" with "key concern" to avoid use of impact criteria phrase out of context.
483	Noise	3-526	No	N/A	3.14-1	Inclusion of the subsistence gradient on this figure makes it hard to read. Suggest removing the subsistence gradient and rather make a gradient for the sound buffers. Subsistence use locations need to be clarified in some fashion, either through this map or text or both.
484	Noise	3-527	No	N/A	Table 3.14-2	Recommend tying subjective/qualitative phrases (i.e. severe annoyance) back to the Human Perception or Response levels and associated noise levels (dBA) listed in Table 3.14-1 to clearly connect to criteria used to determine impact levels. Clarify time aspects, such as intermittent versus steady-state noises, and distinguish from short term/long term duration.
485	Noise	3-528	Yes	3	N/A	Recommend carrying through weather conditions impact on noise under environmental consequences. Winds may mask or carry noises to/from communities.
486	Noise	3-528	Yes	5	N/A	The description of the affected environment for noise as "very quiet" is at odds with the levels of impact identified for the Nanushuk Project and with consideration for the existing activities in the analysis area. The analysis area includes the community of Nuiqsut as well as the Alpine and Kuparuk facilities, and the existing ASRC Mine Site. Existing construction and operations activities are occurring at all of these locations and some (such as Alpine CD4 and the ASRC Mine Site) are located closer to the community of Nuiqsut than the proposed Project facilities and activities. Similarly, the Alpine CPF is located closer to Nuiqsut than the CPF locations evaluated for Alternatives 2 and 4. Alpine is a roadless facility that requires year-round air traffic. If construction and operational noise from the Nanushuk Project is expected to cause minor to major impacts in Nuiqsut, than it stands to reason that residents are already experiencing these or greater effects from existing activities and the analysis area cannot be described as quiet.
487	Noise	3-529	No	1	N/A	Bullet 2, Please remove "CPAI" or Revise to more generally state "Existing industrial and research helicopter activity" as CPAI is not the only user of helicopters on the CRD.
488	Noise	3-531	No	1	N/A	Bullet 5, recommend deleting "or under flight paths" or clearly indicate that regular helicopter use would occur under Alternative 4 only during operations.
489	Noise	3-531	No	1	N/A	Recommend consistent application of the impact criteria. Some are identified as probable and some as possible without clear justification for the findings.
490	Noise	3-532	Yes	1	N/A	The potential impacts to subsistence users listed throughout Section 3.14.7.3 lack important geographic context, or where provided, have both moderate and major impacts grouped within the larger impact area. For each impact, recommend clearly indicating the location at which each level of effect would be expected to occur. For example: impacts to subsistence users would be long term, probable, and moderate within 1 mile of the CPF and major within 400 feet.
491	Noise	3-532	Yes	3	N/A	The potential impacts to subsistence users stated in this paragraph and in other sections addressing Construction Noise Effects do not clearly take into account the seasonality of construction (the majority of the activity including pile driving, gravel mining, and hauling occurs in winter) and the seasonality of subsistence use of the area (lower subsistence use in winter and primarily targeting wolf and wolverine south of project area; see Section 3.17). Recommend incorporating these factors into the impact findings for construction noise activities.
492	Noise	3-533	No	N/A	Table 3.14-5	Noise attenuation for a point source is explained in text (Table notes and on page 3-523) as decreasing by 6dBA for every doubling of distance. Table decreases by 7.5 dBA. Please correct text or tables, or clarify as needed.
493	Noise	3-533	No	N/A	Table 3.14-5	Recommend adding footnotes or text headers to identify that blasting events are very short, and traffic noise levels are unlikely to be steady-state/averaged noise levels.
494	Noise	3-535	No	5	N/A	Recommend improving justification for major finding of construction traffic in Nuiqsut and the Helmericks Homestead. The closest facility to either of these would be the Alternative 4 access road (3.7 miles). Traffic volume and timeframe are not included in evaluation. Clarify whether traffic noise levels are provided as instantaneous noise levels or averaged.
495	Noise	3-536	Yes	1	N/A	Please provide geographic context for the moderate to major impact finding on subsistence users. Based on information in Table 3.14-6, a moderate effect could occur within approximately 200 feet of the drill rig while a major effect would be limited to 50 feet of the drill rig, a location likely to be on top of one of the drill pads.
496	Noise	3-536	No	N/A	Table 3.14-6	Traffic noise impacts are overstated. Traffic noise is typically presented as averaged noise levels, but these tables present traffic noise levels based on individual truck noise levels. Please clarify in text and/or table that the noise would be small percentages of each hour. The introduction of each vehicle into the soundscape may be noticeable, but it would last just a few to several minutes, unless there is a concentration of vehicles at certain times of day, at certain days or times of the year. This is different than averaged (Leq) levels over time of the same dB.
497	Noise	3-537	No	2	N/A	Please delete this paragraph. Analysis of commercial flights in Deadhorse is not within the scope of analysis of this EIS.
498	Noise	3-541	Yes	N/A	N/A	Bullets discussing compared construction traffic noise are overstated. The approximately 6,000 vehicle difference over 4 years, is about 5 vehicles per day if year-round use is applicable).
499	Noise	3-542	No	2	N/A	Cumulative impacts are discussed only in terms of averaged noises, and do not address increased frequency of intermittent noises such as blasting. In combination with similar instances from other projects (e.g., Alpine, ASRC Mine) could increase the frequency of disturbances to the community, while having very little to no impact on averaged noise levels.
500	Noise	3-543	No	2	N/A	Please include applicant's proposed mitigation measure: "Power generated at the CPF, located at the Nanushuk Pad, will be supplied to each drill site through a power cable to reduce noise impacts at each drill site."
501	Noise	3-543	No	2	N/A	Please revise bullet 3 to more closely reflect Applicant Proposed Mitigation Statements: "Routine helicopter use will be avoided during regular development, drilling or production activities, minimizing noise and related impacts to aesthetics, wildlife and subsistence."
502	Land Ownership, Management, and Use	3-545	Yes	4	NA	The sentence reading, "Lands granted to Alaska Native individuals under Native allotment acts are considered private lands but are held in trust by the BIA" is not correct. Pursuant to the Alaska Native Allotment Act of 1906, Native allotments in Alaska are classified as Fee Simple Federally Restricted lands. See ANCSA and Alaska Native Allotment Act. This comment also applies to the statement on page 3-551, paragraph 2.
503	Land Ownership, Management, and Use	3-545	No	6	NA	At the end of the sentence that starts in paragraph 6 on page 3-545, recommend including a reference to the Alaska Department of Natural Resources Best Interest Finding for the North Slope areawide lease sale. Specifically, consider revising the sentence to state as follows: "The rights and responsibilities of the entities holding surface and subsurface lands in the Project area have been further defined in settlement agreements that resolved disputes between the State of Alaska, ASRC, and Kuukpik following lands selections made by each under the Alaska Statehood Act and ANCSA (ADNR 2008b). Consider adding this reference in support of the sentence starting paragraph 4 on page 3-551, which makes the reference, "As described previously, . . ."

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
504	Land Ownership, Management, and Use	3-546	No	3	NA	As stated in paragraph 6 on page 3-545, "The rights and responsibilities of the entities holding surface and subsurface lands in the Project area have been further defined in settlement agreements that resolved disputes between the State of Alaska, ASRC, and Kuukpik following land selections made by each under the Alaska Statehood Act." The parties' rights and responsibilities in regard to regulating oil and gas exploration and development activities on the subject lands, including the extent to which one party to those agreements might impose additional obligations and/or limitations on the rights of another parties' lessee to conduct oil and gas exploration and development activities on the subject lands, is specifically defined in those various settlement agreements. We suggest that the last sentence of paragraph 6 be deleted (i.e., delete the sentence reading, "Landowner approval would be required for development on these lands.") OR , the last sentence of the paragraph should be revised to state the following: "The rights and responsibilities of the entities holding surface and subsurface lands in the Project area in regard to the regulation of oil and gas exploration and development activities on the subject lands have been further defined in various settlement agreements that resolved disputes between the State of Alaska, ASRC, and Kuukpik following lands selections made by each under the Alaska Statehood Act and ANCSA, which settlement agreements include: (1) the March 11, 1974, State/ASRC/Kuukpik Agreement, wherein the State dropped its challenge to Nuiqsut's status as a village eligible for benefits under ANCSA; (2) the 1987 Kuukpik Agreement, wherein Kuukpik consented to ASRC's acquisition of certain subsurface lands in the NPRA provided that ASRC secure Kuukpik's consent before any oil and gas exploration and development activities would be authorized on those lands; (3) the 1991 Settlement Agreement between ASRC and the State of Alaska, which resolved a long-running dispute over land entitlement stemming from the 1974 Agreement and defined the rights and obligations of the State and ASRC in regard to the subject lands; and (4) the 1992 ASRC/Kuukpik Settlement Agreement, wherein Kuukpik gave its consent to ASRC and the State of Alaska, their successors, assigns and lessees, to conduct oil and gas exploration and development operations on the subject ASRC/State subsurface lands."
505	Land Ownership, Management, and Use	3-556	Yes	1	NA	Include consideration of potential gravel mining at Mine Area D in evaluation of potential effects on land ownership, use, and management. Include discussion of ARSC and NSB Mine Sites in cumulative impacts analysis of land ownership, use, and management.
506	Land Ownership, Management, and Use	3-548	No	NA	Table 3.15-1	Recommend revising the definitions of medium and long term to avoid potential overlap. As written, impacts lasting the life of the project could be considered both medium and long term.
507	Land Ownership, Management, and Use	3-548	No	NA	Table 3.15-2	Revise "construction of new roads and pads" to "construction of facilities" as construction of roads and pads excludes consideration of gravel mine development (i.e. the potential development of Mine Area D as a connected action).
508	Land Ownership, Management, and Use	3-551	No	2	N/A	The statement "The Native allotments total approximately 1410 acres, and these lands are held in trust for the Native allottees by the BIA." is not entirely correct. Recommend dropping "and these lands are held in trust for the Native allottees by the BIA."
509	Land Ownership, Management, and Use	3-551	No	3	N/A	In the sentence reading, "Under those lands owned by Kuukpik, . . ." recommend adding the word "surface" before the word "lands" to read: "Under those <u>surface</u> lands owned by Kuukpik, the state of Alaska and ASRC have joint ownership of the subsurface oil and gas rights (Figure 3.15-3)." Also, consider including a reference to the ADNRC Best Interest Finding for the North Slope areawide lease sale, which includes detailed narratives addressing the land ownership status within the Project area.
510	Land Ownership, Management, and Use	3-552	No	3	N/A	The "project area," defined as the general project vicinity on page 3-2, includes portions of Kuparuk and other units. Recommend revising to state that the majority of Resource Development District-zoned lands occur in the eastern portion of the analysis area and include development in the Kuparuk, Ooguruk, and Southern Miluveach Units.
511	Land Ownership, Management, and Use	3-555	No	6	N/A	Please revise the second sentence to acknowledge that large portions of the Kuparuk development occur within the analysis area.
512	Land Ownership, Management, and Use	3-555	No	6	N/A	Please delete reference to CD5 and GMT1 or clarify that both of these facilities occur outside of the analysis area defined for impact evaluation.
513	Land Ownership, Management, and Use	3-556	No	4	N/A	The reference to large-scale development in bullet 2 point overstates the size/scale of the proposed Nanushuk Development. Please revise to state that "rezoning would allow for issuance of an NSB development permit for the Nanushuk Development."
514	Land Ownership, Management, and Use	3-557	No	7	N/A	Recommend deleting the third sentence of paragraph 7 reading, "Similarly, construction and operation of facilities on Kuukpik lands would occur under agreements between the Applicant and Kuukpik and, therefore, would not affect land ownership or status of Kuukpik surface lands." The key point of this section is communicated in the second sentence of the paragraph (i.e., "Construction and operation of project facilities would not affect land ownership or status.") As noted previously, the parties' rights and responsibilities in regard to regulating oil and gas exploration and development activities on the subject lands, including the extent to which one party to those agreements might impose additional obligations and/or limitations on the rights of another parties' lessee to conduct oil and gas exploration and development activities on the subject lands, is specifically defined in those various settlement agreements.
515	Land Ownership, Management, and Use	3-558	No	5	NA	The statement that the whole Project area (i.e., the whole general project vicinity based on the definition on page 3-2) would need to be rezoned is incorrect. Please correct this statement to clarify that areas within the direct project footprint for proposed roads, pads, and pipelines would need to be rezoned.
516	Land Ownership, Management, and Use	3-558	No	6	NA	Recommend referencing the mitigation discussion within this section (3.15.7.1).
517	Land Ownership, Management, and Use	3-559	No	1	NA	Recommend deleting "and adjacent to" as this spatial area has not been defined and areas adjacent to the project will likely continue to be used for both wildlife habitat and subsistence purposes.
518	Land Ownership, Management, and Use	3-559	No	2	NA	Recommend revising the first sentence to clarify that subsistence activities are currently occurring on state lands in addition to wildlife habitat and oil exploration. Revise the second sentence to clarify that wildlife habitat would continue to occur on state lands in addition to subsistence activities.
519	Land Ownership, Management, and Use	3-559	No	2 and 5	N/A	Statement "Subsistence activities would continue to occur on state lands in the analysis area outside of the Project footprint." and in paragraph 5 "Overall, there would be probable, minor, long term effects on land use on state lands. Effects on land use on Kuukpik lands would be probable, minor to moderate, and long term. Development activities and facilities would not eliminate subsistence use in the Project footprint, though they may displace some subsistence users, subsistence travel routes, or both; however, the majority of the analysis area would continue to be used as wildlife habitat and subsistence use areas." This statement downplays the findings in section 3.17 Subsistence and Traditional Use or the findings in 3.17 are overstated. 3.17 finds "Impacts to subsistence use areas, harvester access, and resource availability for caribou from construction, drilling, and operations would be probable, major, and long term."
520	Land Ownership, Management, and Use	3-559	No	3	NA	Revise to clarify that Kuukpik lands are also currently used for wildlife habitat in addition to subsistence harvest and oil and gas exploration.
521	Land Ownership, Management, and Use	3-561	No	3	NA	Please revise the sentence stating that that lands west of Nuiqsut (i.e., within the NPR-A) have been developed consistent with State of Alaska lease provisions. The State has no ownership interest in the subject NPR-A lands. Consider revising the sentence to read: "Oil and gas exploration and development activities on Kuukpik surface lands within the NPR-A have been conducted consistent with federal and ASRC lease provisions, applicable federal and local land regulations, and all governing settlement agreements."
522	Land Ownership, Management, and Use	5-563	No	2	NA	Recommend deleting the first sentence of paragraph 2 reading, "Kuukpik would have an opportunity to address potential negative effects on its lands and shareholder land uses through conditions in its land use agreement with the Applicant." As noted previously, the parties' rights and responsibilities in regard to regulating oil and gas exploration and development activities on the subject lands, including the extent to which one party to those agreements might impose additional obligations and/or limitations on the rights of another parties' lessee to conduct oil and gas exploration and development activities on the subject lands, is specifically defined in those various settlement agreements.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
523	Cultural Resources	3-565	No	1	N/A	Recommend removing sidebar definition of Cultural Resources since it is covered in paragraph 2 with a more thorough definition, or change sidebar definition to match the definition in paragraph 2. A better definition would be from the National Park Service (NPS) "Cultural resources can be defined as physical evidence or place of past human activity; site, object, landscape, structure; or a site, structure, landscape, object or natural feature of significance to a group of people traditionally associated with it."
524	Cultural Resources	3-566	No	3	N/A	Regarding the reference (HDR 2016a): This is referencing a draft version of the Cultural Resources Survey Report. The report was finalized in June 2017.
525	Cultural Resources	3-567	No	2	N/A	Recommend stating that sensitive site description and site location details obtained from the AHRS and TLUI are confidential and are not included in this section. This would help the reader understand why AHRS and TLUI sites discussed are not shown on figures and specific locations and impacts to specific sites are not discussed.
526	Cultural Resources	3-567	No	4	N/A	Please delete or provide substantial justification for buffering TLUI sites by 0.5 mile. While the text correctly notes that some TLUI sites represent broader use areas, this is not always the case and a blanket assumption that the NSB's TLUI points misrepresent the spatial location or extent of the sites is inappropriate. It also contradicts Armstrong's proposed mitigation and the NSB TLUI stipulation that requires the applicant maintain a 500-foot no-build buffer around Critical Sites (including all Traditional Land Use Inventory and Alaska Heritage Resource Survey Sites) if the sites' extents are arbitrarily expanded such that they directly overlap proposed project facilities. The existing NSB 500-foot buffer already takes into account uncertainty in the sites location and size. Armstrong is not proposing changes to the existing mitigation measure which states: "Project facilities will be located outside of a 500-foot buffer from documented cultural resources."
527	Cultural Resources	3-567	No	5	N/A	The spatial term "project vicinity" is not defined in this chapter or Chapter 3.1. Recommend revising this section to use the terms defined in Section 3.1 as appropriate.
528	Cultural Resources	3-568	No	1	N/A	Please revise to omit reference to lack of cultural survey at the ASRC Mine Site as a "data gap" for the Nanushuk Project. The ASRC Mine Site is an independent project and therefore should not be considered as part of the Nanushuk's Project's direct impacts.
529	Cultural Resources	3-571	No	2	N/A	We appreciate that the Cultural Resources discussion analysis framework is based on NEPA. However, mention of the NHPA and the Section 106 consultation process would be appropriate in this section. This information would provide context for the discussion of eligibility in Table 3.16-3 and for consultation in Section 3.16.8. Brief mention of the NSB's Certificate of TLUI Clearance is also warranted.
530	Cultural Resources	3-571	No	5	N/A	None of the infrastructure contemplated for the development exceeds 200 feet in height. Therefore the 0.75-mile indirect effect area should be removed.
531	Cultural Resources	3-573	No	N/A	Table 3.16-2	Geographic Extent- please clarify the spatial area being used as a reference to determine the significance. The EIS analysis area for cultural resources has been defined as 0.5- to 0.75-mile buffer area around the EIS alternative footprints. Thus, linear features and/or polygons that cross the EIS analysis area but extend beyond it appear to trigger impact findings of "regional" or "extended" without communicating the context of the affected cultural resources on a broader scale.
532	Cultural Resources	3-574	No	3	N/A	Recommend defining and describing the four cultural resource types (archeological sites, historic buildings and structures, historic districts, TLUIs) used to evaluate potential impacts in Table 3.16-5. These four types have not been well defined and thus the effects described in Section 3.16.6 lack context regarding how and why they may be affected by the proposed project.
533	Cultural Resources	3-574	No	N/A	Table 3.16-3	Recommend adding a footnote to explain to the reader that TLUI sites are NA for NRHP eligibility because they are not included in the eligibility system (they are from the TLUI database, not the AHRS) and have different defining features.
534	Cultural Resources	3-574	No	N/A	Table 3.16-3	Please revise text to acknowledge that HAR-00162 (Aanayuk Sod House) is an archaeological site not an historic building or structure. A historic building or structure is a resource that a person can physically enter or climb on. This resource is a collapsed sod house that is now a subsurface archaeological resource.
535	Cultural Resources	3-574	No	N/A	Table 3.16-3	Please update the table to reflect USACE's Section 106 consultation correspondence in which SHPO concurred that HAR-00173 is determined Eligible for the NRHP.
536	Cultural Resources	3-575	No	4	N/A	Bullet 1: please clarify that indirect impacts described could occur within 0.5 to 0.75 mile of the Project footprint under all action alternatives.
537	Cultural Resources	3-575	No	4	N/A	Please clarify that in this quote, the term "they" does not refer to the Applicant (i.e. the Applicant did not build the referenced ice road).
538	Cultural Resources	3-575	No	7	N/A	Bullet 2: Recommend rewording to give some context of which resources are under the greatest threat. If this is in reference to HAR-00173, please revise to align with the USACE's Findings of Effect, "No adverse effect to historic properties pursuant to the regulations at 36 CFR Part 800.5(d)(1)."
539	Cultural Resources	3-576	No	N/A	Table 3.16-4	Recommend adding a footnote to the Mine Site material / Excavation bullet to clarify that this refers to Mine Area D, if it is developed.
540	Cultural Resources	3-576	No	N/A	Table 3.16-4	Potential Effects column for Transportation infrastructure (use and maintenance). Recommend moving those items under "Direct impacts due to" to "Indirect impacts due to" immediately below. Change in setting or use is an indirect impact not a direct impact.
541	Cultural Resources	3-576	No	N/A	Table 3.16-4	Potential Effects column for Drilling and operations: Recommend moving those items under "Direct impacts due to:" to "Indirect impacts due to" immediately below. Change in setting or use is an Indirect impact not a direct impact.
542	Cultural Resources	3-576	No	N/A	Table 3.16-4	Potential Effects column for Construction: Recommend moving bullet 3 under "Direct impacts due to:" to "Indirect impacts due to" immediately below. "Changes to the setting of historic properties and other cultural resources from ground-disturbing work" is an indirect impact not a direct impact.
543	Cultural Resources	3-577	No	1	N/A	Recommend that USACE reconfirm its inventory of TLUIs within the analysis area with the NSB.
544	Cultural Resources	3-577	No	1	N/A	The project footprint described includes existing facilities. We contend that if there are effects from use of these facilities, then these resources are already experiencing these effects. Therefore the effects to those resources should be evaluated separately from resources in greenfield areas of the proposed Project and alternatives.
545	Cultural Resources	3-578	No	N/A	Table 3.16-5	Recommend reviewing and updating the findings in this table based on the Findings of Effect letter dated Sept 7, 2017 from the Department of the Army to the State Historic Preservation Officer Alaska Office of History and Archaeology. The letter states that the USACE "has determined that the Project will result in no adverse effect to historic properties pursuant to the regulations at 36 CFR Part 800.5(d)(1). The other unevaluated sites within the indirect APE will not be affected by the Project, as Armstrong will adopt measures, including the following, to avoid these resources during project activities. These measures would be part of the project design and as such, a condition of the permit, if issued. 1) To the extent possible, project facilities would be located outside of a 500-foot buffer from documented cultural resources." The DEIS impact finding of moderate to major, long term to permanent, and local to extended impacts to Historic Buildings and Structures, including historic roads, directly contradicts USACE's finding of no adverse effect in their recent consultation letter to SHPO. The EIS impact finding implies that a loss of integrity would occur (major) and that the damage to resource integrity would be irreparable (permanent).
546	Cultural Resources	3-578	No	N/A	Table 3.16-5	Recommend explaining the conclusions in the impact summary row as they do not capture the full range of impacts identified in the rows above.
547	Cultural Resources	3-578	No	2	N/A	There are specific regulations regarding protection of cultural resources during a spill response.... Recommend referring to Annex M of the <i>Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substance Discharges/Releases</i> (i.e., the Unified Plan (ARRT 2010)). During a spill response, the Unified Plan explicitly requires coordination between the responders and the ADNR Office of History and Archaeology.
548	Cultural Resources	3-579	No	3	N/A	Recommend revising the likelihood of effects to cultural resources, as a spill, even if it occurred along a pipeline and/or reached the tundra, would be highly unlikely to occur at the precise location where the direct project footprint overlaps an identified cultural resource or would impact sites located within .5 mile.
549	Cultural Resources	3-579	No	4	N/A	Recommend revising the statement that, based on a 0.5 mile buffer, "There would be no differences in effects to cultural resources among the action alternatives." This is only true if a 500-foot buffer is used. See other comments regarding buffer areas (pages 3-577 and 3-567).
550	Cultural Resources	3-579	Yes	6	N/A	Please define the analysis area considered for evaluation of cumulative effects for cultural resources. Section 3.1.1.1 in Chapter 3.1 lists three potential cumulative effects analysis areas (i.e. the Lower Colville River Watershed and adjacent watersheds along the Oliktok Road; an expanded area that includes the greater CRD and directly adjacent near shore areas; and in some cases, a more specific or larger area). The cumulative effects analysis in Chapter 3.16 does not make reference to any of these three areas nor does it provide justification as to why one of these would be appropriate given the nature of the resource.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
551	Cultural Resources	3-579	No	N/A	Table 3.16-6	Recommend revising the determination that effects from oil spills on cultural resources would be possible (depending on location and season). The finding of likelihood of effect should include the likelihood of where and when an incident may occur, rather than include a qualifying statement of the finding. We request that this either be better explained or changed to unlikely.
552	Cultural Resources	3-580	No	3	N/A	Please revise the first sentence as follows: "Climate change would not likely change project effects on cultural resources . . ."
553	Cultural Resources	3-580	No	5	N/A	Section 3.16.7.1 - Recommend attributing the reference to the 500-foot buffer to the Applicant Proposed Mitigation Statements, which has been finalized.
554	Cultural Resources	3-580	No	5	N/A	Section 3.16.7.1 - Please remove "and development of an Inadvertent Discovery Plan." Armstrong has not committed to preparing a separate Inadvertent Discoveries Plan. However, Inadvertent Discoveries will be addressed within the forthcoming final version of the CRMP.
555	Subsistence and Traditional Use	3-583	Yes	1 & 2	N/A	The description of subsistence and traditional use does not include reference to berries or roots/plants that are of importance to residents. Suggest inserting reference to these activities as well.
556	Subsistence and Traditional Use	3-583	Yes	3	N/A	The term "Project vicinity" has not been defined in this section or Chapter 3.1. The Project area is defined as "the general Project vicinity" in Sec 3.1. Please clarify if "Project vicinity" is synonymous with the term "Project area" and its relationship to the term "subsistence Project area" used in Section 3.17.
557	Subsistence and Traditional Use	3-584	No	2	N/A	Please include a description of the adequacy, and any limitations, of the information per the title of this section.
558	Subsistence and Traditional Use	3-584	No	2	N/A	Add "participant observation" to the following: "As shown in the table, there are nearly 40 distinct data years that characterize Nuiqsut resident's subsistence uses in the form of harvest surveys, mapping interviews, and global positioning satellite (GPS) tracking studies."
559	Subsistence and Traditional Use	3-584	No	N/A	Table 3.17-1	For all Galginaitis 2014 entries, the Number of Completed Interviews should be "NA" because merely listing the number of crews is not accurate and the number of actual "information exchange interactions" would be difficult to reconstruct from the participatory observation fieldnotes. Scouting trips for whales were reviewed with multiple crew members from each crew each field season. The Study Type should be "Participatory Observation/GPS."
560	Subsistence and Traditional Use	3-586	No	2	N/A	<p>The text, "between areas where only a small number of use areas were reported and areas where a higher number of use areas were reported," obscures what is really being counted and summed - the individuals using the area. "Use area reported" in the sentence, as written, really only refers to "individuals who drew a 'polygon' within the area being considered". This also obscures some of the limitations of the methodology. Please revise to "... between areas where only a small number of individuals reported using the area and areas where a higher number of individuals reported using the area." Note that this measure does not encompass the frequency of such use (for example, one user using the area once counts as much as one user using the area five times; and a party of five using the area once counts five times as much as one user using the area five times). These limitations are discussed below, but their implications for the analytical limitations of the measure being described are not.</p> <p>In addition, please discuss the level of precision of the underlying use area data. Mapping "use areas" by freehand drawing on base maps is relatively imprecise and may be subject to conventions or assumptions on the part of interviewers and/or interviewees. For instance, is the distance inland from the river bank that a hunter has or expects to use when hunting by boat a standard distance that is drawn/mapped as a more-or-less regular shape? Or, does the distance inland vary by user, for each river, the specific section of river used, the side of the bank being used, etc.? This information would help explain the importance of small differences in the precise values reported in Table 3.17-2.</p>
561	Subsistence and Traditional Use	3-587	Yes	1	N/A	Since the 2008-2014 spatial data are not available, the associated limitations should be noted in this paragraph. For example an area may not be used every year or there may be one hunter that accesses an area over the course of this study period.
562	Subsistence and Traditional Use	3-588	No	2	N/A	Please provide a reference for this statement: "While other communities on the North Slope, including Barrow, Atkasuk, Anaktuvuk Pass, and Kaktovik, have ancestral ties to the Project vicinity, contemporary subsistence uses by those communities near the Project are relatively uncommon."
563	Subsistence and Traditional Use	3-588	No	4	N/A	Section 3.17.4.1, Analysis Area, states, "Existing infrastructure, such as Oliktok Dock, Oliktok Road, Spine Road, and Nuna Road were included in the assessment of effects but are described separately from the discussion of the effects in the subsistence project area, so that the Project effects associated with new infrastructure and Project activities can be identified more clearly." However, aside from mention of barging and screeding, these features are not clearly addressed in the assessment of impacts. Recommend specifically addressing these components and explaining how they are relevant to the subsistence impacts evaluation (e.g., relative to user area, phase of project).
564	Subsistence and Traditional Use	3-592	No	N/A	Table 3.17-3	For "Magnitude (resource importance)" it is more appropriate to phrase such effects as affecting a major resource (qualified by the degree or significance of the effect and the duration of the effect), rather than simply labeling them "major" effects. That is the function of the "importance to harvester" aspect of this measure.
565	Subsistence and Traditional Use	3-592	No	N/A	Table 3.17-3	<p>Magnitude (harvester importance) is meant to measure the importance of the area to the user-harvester. However, these criteria are too narrowly focused on the absolute number of different individuals reporting using the same area. The limitation that this does not adequately represent intensity or frequency of use are stated explicitly in the methodology section. Yet, any "major" resource (for Nuiqsut, whale, caribou, and fish) for which greater than 50% of harvester respondents report using the same area will have a determination of subsistence use being affected in a major and extended fashion (and thus overall major) no matter how small the affected use area is or how large the total community use area (or even the total "extended use" use area, which would be smaller than the total use area) for that resource is. A more nuanced and sensitive measure is required.</p> <p>We recommend that the employment of "subsistence use areas" to define harvester importance criteria take into account areas of high, medium, and low overlapping use areas potentially affected by the Project within the context of use throughout the community's total use area. For example, a more informative measure of potential effect is the acreage of "extended" use areas (i.e., dark orange to red) within the "Subsistence Project Area" for each alternative relative to the total acreage of "extended" use areas for the community as a whole. This information could be derived from the available spatial data (SRB&A 2010) and could be approximated from the annual subsistence use area figures available in SRB&A 2010, 2011, 2012, 2013, 2014, 2015, and 2016.</p> <p>Furthermore, we recommend that the harvester importance impact criteria be revised to incorporate the "harvest" aspect of use. The amount of harvest and the frequency (or regularity) of harvest from a given area is an important component of "use of an area" that should be incorporated into any measure of "use area." General measures of "area use" and "% of community harvest" cannot be used to assess potential impacts upon specific and more limited areas potentially affected by a proposed action. While we understand that 2008-2014 spatial data is not available, substantial information can be obtained from the "Harvest Location" and "Harvest Density" figures found in SRB&A 2010, 2011, 2012, 2013, 2014, 2015, and 2016 as well as in Summary Tables presenting the "Percentage of Caribou Harvest Locations and Caribou Harvests by Caribou Hunting Area."</p>
566	Subsistence and Traditional Use	3-592	No		Table 3.17-3	The Magnitude category includes several pages of descriptions of how that category was developed, but the duration category is missing any description of why 5 years was chosen to represent long term. Provide an explanation for the duration criteria.
567	Subsistence and Traditional Use	3-596, 3-598	Yes	N/A	Tables 3.17-6, 3.17-7, and 3.17-11	Tables 3.17-6 and 3.17-11 list wood as a major resource for Nuiqsut households and Table 3.17-7 lists wood as a resource received by Nuiqsut households. However, no discussion of wood is provided in the text. It is likely that gathering wood for heat was important before natural gas was delivered to all households, so if wood needs to remain in the tables, there needs to be some discussion about current practices. The text should also make it clear that harvested wood was typically driftwood since there are no trees on the ACP. If wood remains in the tables, include it in the analysis of subsistence impacts or explain why it is not included.
568	Subsistence and Traditional Use	3-597	No	N/A	Table 3.17-7	Reference is made to residents receiving a moderate percentage of edible walrus meat even though walrus occur primarily in the Chukchi and Bering Seas. The text does not make it clear that sharing subsistence foods is not solely between households in Nuiqsut but also between villages.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
569	Subsistence and Traditional Use	3-598	No	1	N/A	The terminology used for discussing methodology for developing, and measurement of, "overlapping use areas" is misleading. Please clarify that it is not the number of "use areas" that is reported. Rather, it is the number of individuals who report using the same area (the redder the area, the greater the number of people reporting "use" of that area). The methodology collects data by having people report which areas they use by drawing "polygons" but it is not the polygons that are counted, but the number of individual users that report using the overlaps between and among the polygons.
570	Subsistence and Traditional Use	3-599	No	1	N/A	In order to explain the impact finding results, please clarify specifically what the percentages (i.e., greater than 50%, 25-50%, and less than 25%) of harvester use represent in the magnitude definition. For example, the SRB&A 2010 data set represents information gathered from 33 interviews concerning use from 1995 to 2006 (12 years). Does the 50% statistic represent use of the subsistence project area by 17 respondents in at least one of the 12 years evaluated (i.e., 17 respondents reported using the area at least once during the 12 years) or does it include a measure of use over time (i.e., 50% of the total 396 active harvester years [33 respondents x 12 years = 396 active harvester years] or 198 active harvester years.)
571	Subsistence and Traditional Use	3-601	No	4	N/A	Recommend including a map of the Colville River in the Nuiqsut and Project area that identifies Fish Creek and the Nigliq Channel to provide perspective regarding the relevance of the quoted material to the subsistence project area. Also include locations described on page 3-608 such as Anachlik Island, Nuiqsapiaq and Kachemach Mound.
572	Subsistence and Traditional Use	3-603	No	N/A	Table 3.17-9	Please verify and update the percentages of respondents for wolverine, moose, eiders, and arctic char.
573	Subsistence and Traditional Use	3-603	No	1	N/A	Recommend clearly acknowledging that the subsistence project area overlaps portions of the East Channel, and that the East Channel and immediately adjacent areas receive the highest subsistence use within the subsistence project area.
574	Subsistence and Traditional Use	3-605	No	4	N/A	Based on Section 3.17.2.2, the SRB&A 2016 data set represents one community use area per year with a maximum value of 7 years. Use of the data does not provide detail regarding the number of harvesters using the community use area in any given year and the use area could reflect use by one harvester or 20 harvesters. For example, based on the data provided in SRB&A 2010, 2011, 2012, 2013, 2014, 2015, and 2016, the number of overlapping use areas in the Kachemach and Miluveach Rivers beyond their mouths is low, but these areas are given nearly equal weight as high use areas in the Colville because they have been used by at least one harvester in 5 to 7 of the study years. Recommend revising the text "representing areas used by harvesters during a larger number of study years," to state: "representing areas used by <u>at least one harvester</u> during a larger number of study years."
575	Subsistence and Traditional Use	3-605	No	4	N/A	<p>The discussion of caribou subsistence use in the "Subsistence Project Area" relies too heavily on reporting of overlapping subsistence use area data (i.e., that 88% of caribou harvesters have use areas within the "Subsistence Project Area"). Please revise to clearly communicate important context about where caribou subsistence use occurs and how and when those use areas are accessed.</p> <p>For example, based on the SRB&A 2010 data, approximately greater than three-quarters of the "Subsistence Project Area" are in areas of limited or proximal use. Based on similar analysis of figures from SRB&A 2010, 2011, 2012, 2013, 2014, 2015, and 2016, the "Subsistence Project Area" overlapping extended use areas ranges from 5 to 10 percent. Areas of high overlapping subsistence use areas and high harvest location density within the "Subsistence Project Area" are nearly all within the East Channel of the Colville. As documented in the Nuiqsut Caribou Subsistence Monitoring Reports, subsistence harvest of caribou within the "Subsistence Project Area" is almost entirely by boat in the East Channel and to a more limited extent near the mouths of the Miluveach and Kachemach Rivers. Harvest occurs during summer months. This context is important to a meaningful understanding of potential impacts of the proposed project, where those impacts are likely to occur, and how the presence of the project may affect subsistence users.</p> <p>In addition, please provide additional context into variables that affect use of subsistence use areas from year to year. For example, the Nuiqsut Caribou Subsistence Monitoring Reports document that the "distance harvesters are willing to travel along the Colville River each year depends on a number of things including hunting success, water levels, available transportation, locations of camps or cabins, and coinciding subsistence activities such as moose hunting (which generally takes place farther upriver) and seal hunting (which occurs in the ocean)" (SRB&A 2016, p. 27). It would be helpful to understand what the key factors are in determining hunting use in the East Channel of the Colville (i.e., along travel routes to seal hunting areas, proximity to the community, etc.). Caribou migration patterns also vary from year to year, and both resource availability in traditional hunting areas and personal factors influence harvest location, efforts, and success.</p>
576	Subsistence and Traditional Use	3-607	No	4	Fig. 3.17-5	Please provide additional discussion of available information evaluating potential effects of existing development on Nuiqsut resident's subsistence harvest activities. This information is relevant given the similarities and differences between the Alpine project and the proposed Nanushuk Project. Specifically, review of Figure 3.17-5 indicates that the Nigliq channel adjacent to existing Alpine facilities was used 7 of 7 years for which surveys were conducted. Based on the annual subsistence use area and harvest density figures in SRB&A 2010 - 2016, areas within 2 miles of Alpine facilities continue to receive high level of use despite of the presence of infrastructure and resident observations of impact. It is notable that two of the three types of activities/facilities most commonly reported as causing impacts are helicopter and plane traffic, which are not proposed (plane), or are proposed to be used to a very limited degree (helicopters) as part of the Nanushuk Project.
577	Subsistence and Traditional Use	3-608	No	5	N/A	Recommend clarifying which established pipelines within the subsistence project area are being referenced.
578	Subsistence and Traditional Use	3-615	No	2	N/A	Clarify that moose hunting is relatively low in the subsistence project area.
579	Subsistence and Traditional Use	3-616	Yes	N/A	Table 3.17-10	The "% of use areas" requires clarification. Please clarify if the measure is: 1) the % of respondents reporting use of the "subsistence project area" (where the "Total Use Areas" column is actually the number of surveyed harvesters who reported using the subsistence project area for each particular resource), or 2) the "Total Use Areas", which is potentially greater than the actual number of surveyed harvesters?
580	Subsistence and Traditional Use	3-619	No	3 and 4	N/A	Please include a more detailed discussion of how much of the "East Channel area" and "East Channel fishing area" are part of the "subsistence project area."
581	Subsistence and Traditional Use	3-619	No	3	N/A	"Data on Nuiqsut harvest amounts by location are available for caribou and Arctic cisco. Between 2003 and 2007, approximately 1% of the total harvest occurred in the eastern portion of the CRD: a total of 20 caribou were harvested almost solely during the summer months (Braem et al. 2011). In contrast, between 2008 and 2014, the East Channel area accounted for between 7% and 20% of reported caribou harvests (SRB&A 2016)." This text is confusing in that it appears different information is being compared. Explain how 1% of total harvest (is this arctic cisco and caribou?), including 20 caribou, compares with between 7% and 20% of caribou harvests.
582	Subsistence and Traditional Use	3-620	No	2	N/A	"As noted above, high levels of participation in subsistence hunting or harvesting within the subsistence project area are most common for caribou, wolf, wolverine, moose, and eiders (Table 3.17-9)." The table referenced does not fully support this statement, except for caribou.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
583	Subsistence and Traditional Use	3-623	No	1	N/A	The finding of a major impact to caribou harvest relies heavily on reporting of overlapping subsistence use area data. We recommend re-evaluating these findings with consideration for potential effects to high, moderate, or low overlapping subsistence use areas within the context of the community's total use area and incorporation of the amount of harvest and the frequency from the potentially affected areas into the criteria for evaluation of impacts. Between 2008 and 2014, areas of high overlapping use within the "Subsistence Project Area" represent less than 10% of the total area of high overlapping use in each year. The Subsistence Project Area is a subset of the East Channel Colville Caribou Hunting Area described in SRB&A 2016. As reported, caribou harvest from the East Channel Colville area comprised a maximum of 20% of the total annual harvest (mean of 12%). We recommend that environmental consequences analysis provide a more robust discussion of what "user avoidance" behavior is. This analysis should be informed by existing information regarding patterns of use around existing infrastructure as well as discussion of existing patterns of use within the Subsistence Project Area. Additional discussion of project design features and how they may influence potential effects would inform the comparison of alternatives in Section 3.17.6.4. For example, how is the presence of infrastructure and roads located near (or further from) a river used as a transportation corridor likely to affect subsistence use within the project area? How and at what distances is the presence of infrastructure likely to affect fishing in the river near the project area? How and at what distances is the presence of infrastructure likely to affect caribou hunting on the banks of the river in/near the project area. This information will inform a more nuanced discussion of potential impacts and comparison of alternatives.
584	Subsistence and Traditional Use	3-624	No	2	N/A	In the first sentence, please provide spatial context for the impacts described. For example, caribou harvesters would be most likely to be affected by the Project primarily along the East Channel of the Colville River, followed by harvesters of wolf and wolverine primarily in the southwest portion of the subsistence project area.
585	Subsistence and Traditional Use	3-633	No	2	N/A	"People that use the ice road leave trash, and animals eat that trash. Caribou and polar bears—have trash inside of them. Seals—plastic pop rings. Within the last five years, on the ice road, [I] see a lot of trash all over. (MMS 2007c)" This quote requires further context. Recommend clearly indicating that this quote is not specific to the Project.
586	Subsistence and Traditional Use	3-635		3	N/A	Recommend basing findings of potential impact of helicopter use on the evaluation of effects to terrestrial mammals found in Section 3.10.
587	Subsistence and Traditional Use	3-635	Yes	3	N/A	A comment is made about fishing for burbot in the Subsistence Use Area, however the primary habitat area and resource access location is south of Nuiqsut in the Nigliq channel (reference Map 4.4-6 in Final SEIS for the Alpine Satellite Development Plan, Greater Mooses Tooth One Development Project).
588	Subsistence and Traditional Use	3-636	No	4	N/A	Please revise phrase "changes in air quality" to provide more nuanced description of predicted changes in air emissions and where those could occur, consistent with discussion in Section 3.5.
589	Subsistence and Traditional Use	3-636	No	4	N/A	The text, "...to spills or emergencies..." more appropriately should state, "...to potential spills or emergencies..."
590	Subsistence and Traditional Use	3-636	No	5	N/A	Previous discussion in evaluation of construction acknowledges that the project could result in loss or alteration of use, not just loss. Recommend similar discussion be included here.
591	Subsistence and Traditional Use	3-636	No	5	N/A	The applicant has committed to using non-reflective coatings and sheathings on pipelines. Consequently the statement that light reflecting from pipelines may affect movement and distribution of caribou should either be removed or a citation should be provided that supports this claim. Additionally, if this statement is retained, the pipeline coating mitigation should be provided or referenced here for context.
592	Subsistence and Traditional Use	3-638	No	1	N/A	Recommend rephrasing this sentence to avoid statement that hunters would no longer be able to harvest within 1 mile of project facilities. The Applicant has proposed no restrictions around access to the project area for subsistence hunting.
593	Subsistence and Traditional Use	3-641	No	2	N/A	The statement of effects to birds is inconsistent with Section 3.9. Please revise to <u>possible to probable</u> , minor to <u>moderate</u> , and short to long term.
594	Subsistence and Traditional Use	3-641	No	3	N/A	In the second sentence, please delete trenching and ice roads and pads from the list of examples of Project infrastructure used during operations. Trenching is an activity, not infrastructure, and will occur during construction. Ice roads and pads are only proposed for regular use during the construction phase.
595	Subsistence and Traditional Use	3-641	Yes	3	N/A	Recommend revising the text to take into account the fact that water withdrawal requires an ADF&G permit which contains stipulations specifically aimed at protection of fish.
596	Subsistence and Traditional Use	3-643	No		Table 3.17-3	The finding that a very small to small spill could result in up to major impacts on subsistence and traditional use is not supported by the discussion on page 3-642. Please revise to minor to moderate for consistency.
597	Subsistence and Traditional Use	3-644	No		Table 3.17-14	Bowhead whales are listed as a major resource (Table 3.17-11) but the marine mammal entries in this table have "(seals)" and not bowhead whales. Bowhead whales are mentioned under construction activities relative to barging and the screeching at Oliktok Dock but are not addressed at all under drilling and operations.
598	Subsistence and Traditional Use	3-646		1	N/A	Second to last line, first paragraph. Please replace the word "would" with the word "could". It should read - "Alternative 2 could cause a coralling effect..."
599	Subsistence and Traditional Use	3-646	Yes	2	N/A	This section states that Alternative 3 could affect a 'slightly higher percentage of Nuiqsut wolf and wolverine harvesters,' yet the primary habitat areas for these animals are south of Nuiqsut and not in the Project area.
600	Subsistence and Traditional Use	3-649	No		Fig. 3.17-19	Please see comments on Figure 3.1-1 as most of the same errors and inaccuracies apply to Figure 3.17-19.
601	Subsistence and Traditional Use	3-651	No	2		Paragraph 2 indicates that further oil and gas development could increase frequency and severity of impacts, resulting in reduced opportunities to participate in subsistence activities and knowledge sharing. This lacks acknowledgement that further oil and gas development could stabilize or increase shareholder income, employment income, as well as native corporation and government provided services, all of which support a subsistence lifestyle. These financial inputs could help to sustain the subsistence lifestyle and prevent the detrimental effects that are emphasized in this paragraph.
602	Subsistence and Traditional Use	3-651	No	2	N/A	Recommend acknowledging that while these effects could occur, "cultural continuity is strong in Nuiqsut" and subsistence participation is high, as documented on page 3-719.
603	Subsistence and Traditional Use	3-651	No	3	N/A	Recommend a word replacement as follows: "...Table 3.1-1 in Chapter 3.1, Introduction and Analysis Methodology) would <u>could</u> compound effects and increase user avoidance in an area that..."
604	Subsistence and Traditional Use	3-652	No	3	N/A	In the text "cumulative effects to subsistence and traditional use would be;" recommend replacing "would" with "could" for consistency with the effects described in the previous paragraphs.
605	Subsistence and Traditional Use	3-652	Yes	2	N/A	The scientific research surveys are additive to the surveys being conducted by the oil and gas industry and are conducted by various regulatory authorities, universities and research centers.
606	Subsistence and Traditional Use	3-652	Yes	4	N/A	Changes in vegetation cover and habitat are also likely as shrubs move northward to the tundra with warming climate and would have an effect on resources such as birds and terrestrial mammals. Refer to Section 3.8 for further discussion.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
607	Subsistence and Traditional Use	3-652	No	4	N/A	The text states, "These changes could be positive or negative, depending on the resources in question." However, only negative effects are described. Either provide examples of positive impacts of climate change relative to subsistence or remove this sentence.
608	Subsistence and Traditional Use	3-654	No	1	N/A	Please revise the "Applicant's Mitigative Measures" to more clearly reflect the Applicant's Proposed Mitigation Statements provided in the July 2017 DA Permit Application Package. These include: p. 3-645, bullet 6 - revise to "Avoid routine use of helicopters during regular drilling and operations..." p. 3-654, bullet 7 - revise to simply state: Locate Project facilities (including bridges) away from subsistence use areas near the mouth of the Miluveach River. 3-654, bullet 8 - remove "local" before "boaters" and change "subsistence users" to "subsistence use areas."
609	Subsistence and Traditional Use	3-654	No	1	N/A	Please add measures from Applicant Proposed Mitigation Statements relating to reduction of impacts to caribou: - Pipelines will have a non-reflective finish to reduce reflectivity and potential impacts to wildlife from visual disturbances. - All pipelines, HSMs, and suspended cables will be a minimum of 7 feet above tundra surface except where pipelines intersect a road or pad or are constructed within 100 feet of an existing pipeline that is elevated less than 5 feet. - Roads and pipelines will be separated by a minimum of 500 feet, where feasible, to minimize caribou disturbance and excessive snow drift accumulation and reduce the risk of vehicle impacts to the pipeline.
610	Socioeconomics	N/A	Yes	N/A	N/A	The terminology in the socioeconomics section is not always consistent or clear relative to identifying whether impacts/effects are beneficial or adverse. Most of the time, beneficial effects are distinguished as "benefits," whereas adverse effects are described as "impacts." However, changes to population and demographics are not clear as to whether the impacts are beneficial or adverse. Recommend explaining the terminology and conventions used in Section 3.18.4.2.
611	Socioeconomics	3-656	No	2	N/A	In the last sentence in this paragraph, living a traditional lifestyle with emphasis on subsistence does not occur "despite" job opportunities. These are not mutually exclusive. This should be corrected or deleted to acknowledge that subsistence and employment can exist harmoniously.
612	Socioeconomics	3-657	No	2	N/A	Indicate whether the NSB's 2015 <i>Economic Profile and Census</i> (2015) meets the U.S. Census Bureau Statistical Quality Standards (reissued July 2013). Recommend providing a clearer explanation of the limitations of this report (for example, see Section 3.20.2 Review and Adequacy of Information about Human Health and Safety).
613	Socioeconomics	3-659	No	N/A	Table 3.18-1	Without the Project, there would continue to be a downward trend in employment, income, and revenue. Clarify if the "normal limits and trends" in Table 3.18-1 take this into account. Stabilization of these negative trends would have a moderate beneficial impact. In other words, these factors would not necessarily need to show an increasing trend, but merely stop decreasing in order for a moderate beneficial impact to occur. Describe how the Project's offset of declining revenues, employment, and income factors into the magnitude criteria.
614	Socioeconomics	3-661	No	1	N/A	Replace "Nuiqsut is likely" with "Nuiqsut is the community that is most likely."
615	Socioeconomics	3-663	No	1	N/A	Recommend explaining either here or in the review of data adequacy section, why federal and state sources may over report income estimates. The review of data adequacy explains why this may be the case for the NSB as a whole, but not for individual communities not affected by workers in Prudhoe Bay.
616	Socioeconomics	3-663	No	2	N/A	Please clarify if the statement that 61% of households report owning village corporation shares also applies to regional corporation shares.
617	Socioeconomics	3-664	No	5	N/A	Recommend clarifying what entity constructs the 17-mile ice road each winter.
618	Socioeconomics	3-665	No	2	N/A	To be consistent with the description of the Nanushuk Project, Alpine should be described as 4 miles from the community, at its closest point.
619	Socioeconomics	3-666	No	2	N/A	"NSB notes that the decline in oil and gas activity on the North Slope over the last several years has been slowing population growth and out-migration by the non- Iñupiat population (NSB 2017a)." Confirm that this statement is accurate relative to slowing out-migration by the non- Iñupiat population. Also, recommend inclusion of a discussion about out-migration of the Iñupiat population.
620	Socioeconomics	3-667	No	4	N/A	Please clarify if the NSB reported number of "oil industry employed" at "11 NSB residents" is a reference to those employed by the operating companies themselves, or includes oil and gas service companies a number of which are subsidiaries of ANCSA corporations. Please also correct the reference to subsidiary companies to "the oil and gas industry".
621	Socioeconomics	3-678	No	1	N/A	In the third bullet, clarify if the effects on community cohesion and social character are only adverse or both adverse and beneficial.
622	Socioeconomics	3-679	No	1	N/A	Please update employment values for consistency with Section 2.3.2.7.8 (i.e., 600 to 1,000 workers during construction and 40 to 200 during operations). Comment also applies to page 3-683, paragraph 2.
623	Socioeconomics	3-679		2		Many jobs in drilling, construction, operations, maintenance and support services would have skill sets in addition to those described in the paragraph. Nuiqsut and NSB residents are currently and would continue to be given opportunities to receive the necessary training to obtain employment in all phases of Project execution and operation.
624	Socioeconomics	3-682	No	1	N/A	Recommend revising to acknowledge the importance of "local government" employment in the smaller, more remote villages compared to the larger, more diverse economy of Barrow. A review of 2016 ADLWD employment data (ADLWD Alaska Local and Regional Information, http://live.laborstats.alaska.gov/alari/) shows a higher number of NSB jobs per capita in smaller communities such as Atkasuk and Point Lay than in Barrow. In addition, a higher percentage of all jobs held by residents are in the local government sector. These data suggest that while there are more people employed in NSB jobs in Barrow than in other communities, the relative importance of NSB is greater in the smaller communities.
625	Socioeconomics	3-683		1	N/A	A 20% increase in production and revenue would be "well outside normal limits and trends".
626	Socioeconomics	3-688	No	N/A	Table 3-18-5	Recommend adding a footnote to the Gravel Extraction row to clarify that this refers to Mine Area D, if it is developed. Impacts related to the ASRC and NSB Mine Sites should be addressed in the cumulative impacts section.
627	Socioeconomics	3-689	No	N/A	Table 3.18-5	The inclusion of oil spills in this table is misleading relative to the "Likelihood" column because it does not include the further explanation of the likelihood of a spill occurring. Furthermore, oils spills are not a "Project effect" (first column heading). Recommend removing the oil spill rows and instead adding a note referencing Table 3.18-4. If oil spills are left in the table, add to the Likelihood column an explanation regarding the likelihood of the spill occurring followed by the likelihood of effects if a spill were to occur.
628	Socioeconomics	3-690	No	8	N/A	Correct verb tense ("would" to "has and will continue to") to acknowledge that past and present activities have already been beneficial in establishing and sustaining the state economy, etc.
629	Socioeconomics	3-691	No	5	N/A	The mitigation summarized here does not fully capture Armstrong's proposed mitigation measure. Please revise to acknowledge that "The Applicant has proposed working with the Kuukpiik Corporation, the City of Nuiqsut, and the NSB to ensure Nuiqsut and NSB residents have opportunities to apply for work on the Nanushuk Development Project and providing local North Slope companies with opportunities to compete for contract work associated with the Project. The Applicant has also proposed working with contractors, trade associations, Alaska Process Careers Consortium, and Iłisaġvik College to develop training programs for North Slope residents, if needed. "
630	Socioeconomics	3-691	No	5	N/A	Add: "The Applicant would provide regular project updates to the community and leadership in Nuiqsut during project development, and would incorporate measures to address concerns into project designs, where practicable. Additionally, the Applicant would continue to communicate regularly with the community and leadership in Nuiqsut throughout construction and operations. "
631	Socioeconomics	3-691	No	6	N/A	Text states, "Other mitigation proposed by the Applicant to address potential subsistence effects would indirectly minimize the potential for social and economic effects from the Project." Recommend changing "would indirectly minimize" to "would directly minimize."
632	Contaminated Sites	3-694	No	1	N/A	Recommend using a 0.25 mile radius for the analysis area. Contaminated sites further than 0.25 mile from proposed infrastructure would not affect the Project or be affected by it.
633	Contaminated Sites	3-696	No	N/A	Figure 3.19-1	Recommend removing from the figure all spill sites (Oberon #1, Colville River#1, and Ugnu #1) located outside of the analysis area.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
634	Contaminated Sites	3-697	No	2	N/A	Recommend revising the discussion of spill locations to provide additional context regarding what happens after a spill occurs. As written, this section suggests that all of the spilled material remains in place. In reality most if not all of the spilled material has been recovered. For example, the 30,000 lb. spill of drilling muds at Kuparuk 1Q is listed as recovered and the case has been closed. This context is important to help the reader understand the actual likelihood of encountering spilled materials as a result of project activities.
635	Contaminated Sites	3-702	No	4	N/A	First sentence in Section 3.19.6.3.1, recommend revising "very low to high" to "very low to moderate" for consistency with findings throughout the section.
636	Contaminated Sites	3-702	Yes	5	N/A	In this paragraph and elsewhere in the section, recommend avoiding mixing reference to contaminated sites and spill locations. For example, this paragraph makes a statement about the location of contaminated sites and provides a supporting sentence discussing KRU 1Q. KRU 1Q is not a contaminated site but rather has been the location of several spills.
637	Contaminated Sites	3-702	No	5	N/A	The quantity of material spilled at Kuparuk 1Q over the last 20 years does not in and of itself justify a moderate finding. Recommend considering what project activities would occur near that location (i.e., road expansion or just use of an existing road, whether activities would be ground disturbing) and the status of clean up of the materials spilled (i.e. KRU 1Q spill site has been cleaned up and closed).
638	Contaminated Sites	3-706	Yes	4	N/A	For each alternative, recommend providing additional explanation about how project activities occurring near these sites pose a risk of encountering existing contamination. For example, does use of an existing road pose the same risk as performing road upgrades or excavating gravel?
639	Contaminated Sites	3-707	No	2	N/A	Figure 3.19-1 shows the Placer #1 and Placer #2 spill sites overlapping proposed infrastructure for Alternative 4. However, these sites do not appear to be included in Table 3.19-5 or 3.19-6. Recommend checking for consistency.
640	Human Health and Safety	3-709	No	1	N/A	This first paragraph is inconsistent with other sections of the EIS and identifies project impacts that are not supported by the analysis later in the section. Recommend deleting or revising to clarify that the impacts discussed are examples of the types of impacts being evaluated, not necessarily ones that have been identified.
641	Human Health and Safety	3-710	No	3	N/A	Please revise as follows, "...direct health and safety effects, <u>could be adverse or beneficial and</u> are more likely to be experience by Nuiqsut residents..."
642	Human Health and Safety	3-710	No	3	N/A	Recommend explaining which communities would be impacted to a greater degree and provide additional justification as to why they are not further discussed, or delete the phrase "greater or"
643	Human Health and Safety	3-711	No	N/A	Table 3.20-2	Recommend moving the statement "information on potential for oil spills (Chapter 4.0, Spill Risk Assessment, Prevention, and Planning)," from the Construction row, Effects Analysis Methods column, to the Potential spills, releases or events row.
644	Human Health and Safety	3-721	No	3	N/A	Recommend reframing discussion of the existing effects of contaminated sites on health in Nuiqsut by considering the presence of contaminated sites within 0.5 mile of Nuiqsut, not the Project.
645	Human Health and Safety	3-725	No	7	N/A	Please clarify if or how the total road length or fill volume are relevant factors in determination of effects on human health and safety. Table 3.20-6 identifies indirect changes in subsistence diet, increased stress and concerns about spill potential and contamination, and indirect impacts and benefits related to changes in revenue and income as the most probable effects. Recommend considering whether there are key differentiators that would affect the factors most likely to result in effects on health. Comment also applies to similar text on page 3-735, paragraph 4.
646	Human Health and Safety	3-727	No	2	N/A	Altered Use of Land - Potential benefit from access to industrial roads, increased access to additional sources of food and goods via road system, decrease food insecurity.
647	Human Health and Safety	3-728	No	3	N/A	Recommend revising the statement that "small spills occur frequently" as this phrase is not consistent with the language in Chapter 4 and has potential to misinterpreted. Consider revising to "there is a high likelihood of a small spill occurring during the life of the Project"
648	Human Health and Safety	3-732	No	1	N/A	Please revise the following statement "A large oil spill could impact community health, particularly if local residents were engaged to help respond to, contain, or remediate the spill." Spill responders would be appropriately trained (e.g. HAZWOPER) and subject to medical monitoring. An exclusion zone would be established. Access would be restricted to spill responders only.
649	Human Health and Safety	3-732	No	6	N/A	Please clarify if the effects to water and sanitation services would be beneficial or adverse. No adverse effects to water and sanitation services are described in the paragraph but the last sentence summarizing effects does not indicate effects would be beneficial.
650	Human Health and Safety	3-734	No	3	N/A	Please add additional information between the first sentence of the paragraph (which establishes potential negative health impacts) and the last sentence (which determines the impacts to be unlikely and minor). Recommend adding something like the following: <i>Exposure of residents to large spills is mitigated by identifying the contaminated area and limiting access to the area to trained responders. In the event that a large spill directly impacted local residents, potential stresses to the local clinic would be addressed by the Incident Command, which is described in Section 4.3.2.1.</i>
651	Human Health and Safety	3-739	No	3	N/A	Please revise the "Applicant's Mitigative Measures" to more clearly reflect the Applicant's Proposed Mitigation Statements provided in the July 2017 DA Permit Application Package. These include: p. 3-739, bullet 3 - revise to "A new project specific airstrip would not be developed as part of the Project. This avoids regular fixed wing air traffic into the project area reducing noise/disturbance impacts to local residents, subsistence users, and wildlife, as well as air quality impacts." p. 3-739, bullet 4 - delete. The avoidance of fixed wing air travel to the project area has already been addressed. p. 3-739, bullet 6 - revise "possible" to "practicable"
652	Human Health and Safety	3-739	No	7	N/A	Consider including road-facilitated emergency response from Applicant Proposed Mitigation Statements: "Gravel road connection to existing infrastructure provides reliable year-round, rapid access to project facilities in the event of an emergency, including a blowout, oil spill, or need for medical evacuation."
653	Environmental Justice	NA	Yes	N/A	N/A	We do not dispute the conclusion that Nuiqsut is an environmental justice community; however, we suggest that the discussion of how to get to that conclusion be simplified in this section. Because Nuiqsut is a minority community and heavily reliant on subsistence, that qualifies it as an environmental justice community under Executive Order 12898. The section should refer to the socioeconomic section for the census-related information already presented and conclude that Nuiqsut is an environmental justice community without trying to re-hash and re-formulate the analysis to fit the environmental justice section. If the full analysis in the section stays, then we offer the following specific comments (see below).
654	Environmental Justice	3-741	No	text box	N/A	The definitions of minority population and low-income population in the text box are unclear because the requirement that people be similarly affected by the Project appears to apply only to geographically dispersed people. Recommend clarification that this also applies to groups of people in geographic proximity.
655	Environmental Justice	3-742	No	4	N/A	Recommend referring to nonminority or non-low-income populations as the "comparison populations" in the third and fourth bullets for consistency with Figure 3.21-1 and to avoid the implication that the comparison population does not have a minority or low-income component.
656	Environmental Justice	3-743	No	NA	Figure 3.21-1	The flow chart is not entirely clear. For step 1, it states "If the answer to any of the questions below are [sic] YES, proceed to the next step. If any are NO, stop." It is not clear what to do if the answer to one question in a box (for example the Minority box) is yes and the answer to another question is no. Recommend deleting "If any are NO, stop." Also, the "STOP" between steps 3 and 4 could be interpreted to mean there would not be any community engagement but for the EJ analysis.
657	Environmental Justice	3-749	No	5	N/A	Recommend revising bullet 4 to more clearly state the disproportionately high and adverse impact identified. As described, this text suggests disproportionately high and adverse impacts would occur to numerous resources in the natural and social environment rather than the one specific impact identified in the following sections.
658	Environmental Justice	3-751	No	N/A	Table 3-21-7	This table contains information that is not particularly relevant to the EJ evaluation. Recommend deleting the resources that are not relevant and confirming that the ones remaining clearly indicate EJ relevance in the Project Effects Summary column.
659	Environmental Justice	3-753	No	4	N/A	Not all resource impacts (for example geology) are relevant to the EJ evaluation and only one resource had high and adverse effects. Recommend changing "However, most of the resource effects (impacts to geology, floodplains, wetlands, etc.) would not be high and adverse" to "However, the only resource effects that would be high and adverse would be those to subsistence, in particular caribou harvests."
660	Environmental Justice	3-754	No	1	N/A	Please strike the indicated text in the following sentence as no lease fees are paid: "The Project would result in beneficial financial impacts locally, regionally, and statewide through increased lease fees to Kuukpiik, increased property tax revenues to the NSB...."
661	Environmental Justice	3-754	No	5	N/A	The statement that disturbance and mortality to birds could be major in the short term is inconsistent with the findings of Section 3.9. Please revise to minor to moderate for consistency.

Comment No.	Chapter/Section (select)	Page No.	General Comment (Y/N)	Paragraph No.	Figure or Table No.	Reviewer Comment
662	Environmental Justice	3-755	No	4	N/A	In Section 3.21.6.3.4, add changes in diet as a potential health impact for consistency with Section 3.20 key findings.
663	Environmental Justice	7-757	No	1	N/A	Please add the fact that translators were available during public meetings.
664	Environmental Justice	3-757	No	3	N/A	Recommend clarifying whether potential mitigation to avoid, minimize, or mitigate the identified disproportionately high and adverse effect would be identified in the Final EIS or in the ROD when USACE makes a permit decision that includes determination of appropriate mitigation.
665	Unavoidable Adverse Effects, Irreversible and Irrecoverable Loss of Resources	3-759	No	1	N/A	Please ensure these bullets are updated to reflect any revisions to impact findings in resource sections in response to comments on those sections. These include: Bullet 1: Please see comment on Section 3.14 (page 3-536) regarding the probable, major impact finding with respect to traffic noise. Bullet 2: Please see comment on Section 3.16 (page 3-578) regarding the probable, major impact finding with respect to historic properties.
666	Unavoidable Adverse Effects, Irreversible and Irrecoverable Loss of Resources	3-759	No	1	N/A	Bullet 2: Please clarify the contradiction "medium-term" and "permanent" with respect to cultural resources.
667	Unavoidable Adverse Effects, Irreversible and Irrecoverable Loss of Resources	3-759	No	1	N/A	Bullet 3: Please revise to maintain consistency with Section 3.17 Subsistence and Traditional Use. According to Table 3.17-14, impacts would be probable, major and long term only for caribou subsistence use areas during drilling and operations; other impacts for caribou during drilling and operations would be possible not probable. All probable major impacts for caribou during construction would be medium term.
668	Unavoidable Adverse Effects, Irreversible and Irrecoverable Loss of Resources	3-759	No	2	N/A	The term "energy" does not identify a specific resource. Please clarify the type of energy that would be destroyed or consumed. Consider rewording the sentence as follows: "Irrecoverable losses are losses to production or use of renewable resources for the period of the proposed project, during which time resource cannot be used". Consider removing the reference to subsistence resources, as it is not a true statement that the resources could not be used. Rather, the subsistence section claims that users would avoid developed areas.
669	Unavoidable Adverse Effects, Irreversible and Irrecoverable Loss of Resources	3-760	No	2	N/A	Bullet 3: Recommend removing this bullet, as the ADNR water use permits that are required for water withdrawal includes stipulations to ensure that lake recharge occurs.
670	Unavoidable Adverse Effects, Irreversible and Irrecoverable Loss of Resources	3-760	No	1	N/A	Bullet 4: Recommend providing a spatial and temporal extent for the statement by clarifying that subsistence use in the immediate vicinity of the project footprint would be affected and use in the surrounding areas may also be affected, but not necessarily harvest numbers themselves.
671	Spill Risk Assessment, Prevention, and Planning	4-1	Yes	N/A	N/A	Please revise Section 4.1 to acknowledge that the first and best response to spills is prevention and that the Nanushuk Project has been designed with both physical and operational features to minimize the risk of a spill.
672	Spill Risk Assessment, Prevention, and Planning	4-1	Yes	1	N/A	The first sentence suggests that "risk" is synonymous with "likelihood." Recommend that the term "risk" be properly defined as it pertains to this chapter and consistently used throughout the EIS. A Risk Assessment is generally considered an assessment of the probability and the consequence of a potential event (e.g. spill). For example, the probability of an accidental release occurring from a pipeline over land may be the same as the probability of a release occurring over a waterbody, but the consequences over water would be greater.
673	Spill Risk Assessment, Prevention, and Planning	4-1	Yes	1	N/A	In the introduction to this section, recommend introducing the types of fluids being evaluated as part of the oil spill risk assessment. Most are petroleum based, but some, like seawater, freshwater, or produced water, may require some explanation as to the adverse impacts that may occur resulting from a spill.
674	Spill Risk Assessment, Prevention, and Planning	4-3	Yes	N/A	N/A	Assessment Methods Overview is awkward and difficult to follow. We recommend opening the section by stating that the EIS conducts a qualitative analysis of the potential for oil spills because it provides a good representation of what can reasonably be expected on the North Slope. Then describe the way the analysis was conducted. Finally, state that the applicant has conducted quantitative analyses, but because of regulatory requirements that require the applicant to analyze and demonstrate preparedness for a range of spill events (including spills of a magnitude that have never occurred on the North Slope), that analysis is overly conservative for purposes of the NEPA review.
675	Spill Risk Assessment, Prevention, and Planning	4-5	Yes	N/A	Figures 4.2-1 and 4.2-2	Numerous figures and tables reference ADEC (2013), but there is no corresponding report in the Reference section. Please add the reference.
676	Spill Risk Assessment, Prevention, and Planning	4-6	No	N/A	Figure 4.2-3	Please define "5 per. Mov. Avg."
677	Spill Risk Assessment, Prevention, and Planning	4-10	Yes	3	N/A	Recommend adding that drill cuttings from the Repsol incident were "water-based."
678	Spill Risk Assessment, Prevention, and Planning	4-10	Yes	3	N/A	Please discuss why the risk of shallow gas blowouts are low and decreasing with time. Refer to shallow gas studies and AOGCC (2010) report.
679	Spill Risk Assessment, Prevention, and Planning	4-14	Yes	1	N/A	Please clarify that the reference to oil spills at "gravel mine sites" refers to Mine Area D, which, if developed would be a connected action.
680	Spill Risk Assessment, Prevention, and Planning	4-22	No	2	N/A	Recommend revising this statement for consistency with Chapter 2 as follows: "All action alternatives would include three drill sites (DS1, DS2, and DS3) that, combined, would accommodate up to 146 production and injection wells."
681	Spill Risk Assessment, Prevention, and Planning	4-27	No	3	N/A	Recommend providing additional context for why a guillotine break is very unlikely on the North Slope in addition to one never having occurred. For example, certain conditions that can cause these ruptures are not present, such as active faults and landslide prone topography.
682	Spill Risk Assessment, Prevention, and Planning	4-32	No	2	N/A	Recommend stating whether the aboveground bulk storage tank spills described were within secondary containment.
683	Spill Risk Assessment, Prevention, and Planning	4-39	No	3	NA	Please clarify that bullet 3 specifying weekly visual inspection applies only to the export/import pipeline and not the infield pipelines (also known as flow lines). This is an important distinction (refer to 18 AAC 75.055(a)(3)).
684	Spill Risk Assessment, Prevention, and Planning	4-40	No	1	N/A	First paragraph: Please replace "operations center" with "central control room".
685	Consultation and Coordination	5-3	No	1	N/A	Recommend adding a list of agencies that were invited to participate in the scoping meetings (USCG and USDOT [PHMSA]).